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American Cinematographer

An educational and instructive publication, espousing progress and art in motion picture photography.
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SILAS EDGAR SNYDER
Editor and General Manager
JOSEPH DUBRAY
Technical Editor
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Attention A. S. C.

The roster of the membership is omitted in this issue to give time for complete revision. All members are urged to phone any changes in place of employment as soon as they occur. In no other way can our records be kept straight and up to date. The roster will be published in full in the October issue of THE CINEMATOGRAPHER.—Editor.

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EDITORIAL--The Voice of the A. S. C.

OUR FRONT COVER

The beautiful front cover of this, the September issue of THE AMERICAN CINEMATOGRAPHER, is a reproduction from a photograph shot in Italy by President John W. Boyle, of the American Society of Cinematographers. It will be remembered that Mr. Boyle did the first camera work on "Ben Hur." He has set up his camera in countries all around the world and it was from his unusually fine collection of stills made in foreign locations that our September cover was selected.

This particular shot, the first marine cover THE AMERICAN CINEMATOGRAPHER has presented, was made by Mr. Boyle, at Anzio, a small, but important, fishing port of great antiquity, on the Mediterranean, about sixty miles from Rome, when the "Ben Hur" Company was sent there on location. Anzio is said to have been the birthplace and a favorite residence of the Emperor Nero and is still frequented by Roman aristocracy. In the vicinity are interesting ruins of the old Roman baths.

The fishing fleet of Anzio with its colorful craft is described by Mr. Boyle as charming in the extreme which is evident by the picture even without the natural colors. Our President arose before sunrise to trap this shot with his camera.

A SCHOOL OF INSTRUCTION

Be It Resolved, *that all the resources of the American Society of Cinematographers be thrown into the development and advancement of* sound pictures *for the benefit of its members and of the motion picture industry generally, which will help the cinematographers to give the producers the most direct and efficient service in the combination of sound and photography. And further be it resolved that this Society lay out a schedule of classes to be maintaned indefinitely for the instruction of its members.*

This resolution was unanimously adopted at the regular meeting of the Board of Governors held Monday night, August 13th, after full discussion and was later broadcasted throughout the membership and the industry in general. This action was taken as an educational measure primarily for the instruction of the members of the Society in the cinematography of sound pictures, but also with the broader view of betterment to the industry as a whole through the greatest possible efficiency of A.S.C. operatives. The course of instruction as outlined by President Boyle and the Board of Governors so far as plans have been made will be a series of lectures by experts of the General Electric, Western Electric, Radio Corporation of America, American Telegraph and Telephone Company, etc., etc. By this action of the Board of Governors the A.S.C. recognizes that the sound picture is a condition and not merely a theory and that this new development will be with us for some time.

LIVING UP TO ITS IDEALS

The determination of the A.S.C. to inaugurate a school of instruction to perfect its membership in the technique of sound picture cinematography is in line with its traditions which have always reflected progress. The members of the A.S.C. who have reached the height of the cinematographic art, and there are many, started with the very beginnings of motion pictures and, evolving with the industry through the years, are still doing the big jobs, and still turning out the masterpieces. The good camera man gets better with the onrush of time.

The A.S.C. is ten years old. The cameramasters who make up its membership have been prominent in camera work for fifteen, twenty and twenty-five years and a few for even a longer time and here we find these grand old artists (still young in years) up on their toes eagerly and determinedly taking hold of this new phase of cinematographic evolution, seeking always to do things in the better way. And of their own free will they do it—not waiting to be caught flat-footed in the presence of a new duty—a new demand.

Surely the Society is living up to its ideals of Loyalty, Progress and Art—the industry's finest example.

A FOUNDATION WANTED

The AMERICAN CINEMATOGRAPHER knows of scores of men who are individually researching along lines looking to the betterment of motion pictures, especially through improved apparatus, materials and methods, and some of them have perfected inventions but have not yet applied for patents. This is because they have not the capital to see their inventions through the patent office and to commercialize them when patents are secured. This is a pitiful situation and it makes one wonder that some philanthropic person interested in the betterment of pictures has not long since created a foundation to finance those inventors who have achieved something of intrinsic merit. Such a foundation would in time pay satisfactory dividends for, from among all these independent researchers, constantly increasing in numbers, there is certain to emerge many useful inventions and occasionally something revolutionary. It is a field worthy of the attention of any man or organization interested in upraising the glory of the cinema.

KEEPING THE RECORD STRAIGHT

In this issue of THE AMERICAN CINEMATOGRAPHER are published two articles of intense interest to all the workers in the motion picture industry and allied arts and crafts who have to do with the technical side of sound pictures, viz: "Who Invented Sound Pictures," by Eugene Augustin Lauste and "The Whitson System," by Delmar A. Whitson.

Both these articles, written by men who may be justly classed as pioneers, will illumine the general subject and help to keep the records straight.

Believing in the principle that credit for achievement should be properly placed THE AMERICAN CINEMATOGRAPHER has set about to find out the facts in the evolution of sound pictures and to record them in cold type that all interested may see.

With no axe of any kind to grind THE AMERICAN CINEMATOGRAPHER may be depended upon to publish information placed at its disposal without color or ulterior purpose and it assures its readers that it will have many more things of interest to say about this subject of sound pictures, their theory and practice in production, their early development, present day operation and future possibilities.

CONGRATULATIONS, MR. BALL

THE AMERICAN CINEMATOGRAPHER congratulates Mr. J. A. Ball, of Technicolor, upon his appointment to head the new Technical Bureau and it congratulates also the Producers Association upon its discretion in making so desirable a choice.

Charles Rosher, 1st V. P., A. S. C.

John W. Boyle, President, A. S. C.

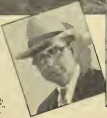
E. Burton Steene, 2nd V. P., A. S. C.

THE CAMERAMASTERS OF THE WORLD.

"You gentlemen here are known throughout the world, without any dispute or question, as the greatest exponents of the art of photography—there is no question about it—the cameramen of Hollywood are the greatest known in the art of cinematography — in that field you are supreme."

—Tribute to the A. S. C. by Dr. Kenneth Mees, Director Research Laboratory, Eastman Kodak Co., Rochester, N. Y.

Production still by Oliver Sigurdson, A. S. C.



Ira Morgan, 3rd V. P., A. S. C.

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SPONSORED for the American Society of Cinematographers and their interesting publication, "The American Cinematographer," in appreciation of long years of good-will and cooperation.—Edward O. Blackburn, Vice-President, J. E. Brulatour, Inc., Pacific Coast Distributors of Eastman Motion Picture Films.

—Reproduced from HOLLYWOOD TODAY—1928.

The Whitson System

Pioneering in Sound Motion Pictures --- A Narrative of the Scientific Development of the Photophone

By DELMAR A. WHITSON

Inventor and Physicist of the Whitson Photophone Corporation, Los Angeles.

[Delmar A. Whitson is a native of Oklahoma. He has always been of a scientific turn of mind, and very early in life began to take an interest in scientific studies. In 1904 he built and operated what is said to have been the first amateur radio station, and in 1906 removed to San Francisco where he began to work upon his theory of sound pictures. When the war broke out he was appointed supervising instructor of radio communication for the 13th Division, A. E. F. In 1921, he produced the first motion picture dealing with the Einstein theory, a two-reel subject entitled "Reversibility and Relativity," released by Louis B. Mayer. Later Mr. Whitson associated himself with the Whitson Photophone Corporation, a company organized to commercialize his sound picture inventions as set forth in this article. The main idea back of this project is to serve the independent producer, the claim of the organizers being that the Whitson System is the most economical of installation and efficient of operation.—EDITOR'S NOTE.]

My earliest recollections of motion pictures were accompanied by a sense of something being fundamentally wrong. I accepted the effect of illusion as a matter of fact, but my creative sense demanded even more. They lacked something and this incompleteness was ever apparent when viewing one of those early efforts. But this open objection courted my insatiable desire to invent or to complete the illusion, and the possibilities of combining both speech and action upon the same film intrigued my imagination in 1906 after reading an interesting account of the Photographone, the invention of Ernest Ruhmer, a European scientist, which was an experimental device he had constructed for photographing the voice upon a moving picture film.

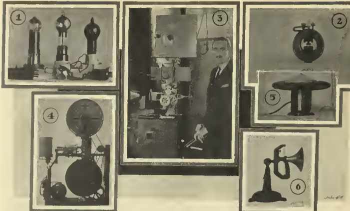
In doing this he had made use of an electric arc formed between two carbons and imposed his voice upon the electric current flowing through the arc light by the aid of a telephone transmitter. The light from this arc was passed through a narrow slit which had a cylindrical lens mounted adjacent thereto, and the light was then brought to a focus upon the film, which was rapidly moved past this image.

Upon developing the film, Herr Ruhmer obtained convincing proof that he had actually photographed the voice and, in reproducing his test, he employed the same setup, but disconnected his telephone transmitter and introduced a selenium cell beyond the film or on the side opposite the arc light so that whenever the film was developed and moved past the focused light image the photographed sound cast shadows upon the selenium cell, and this changing light action, falling upon the cell, caused it to vary its resistance more or less proportionately to an electric current which was also flowing through a telephone receiver and both were in series with a battery source; he was then enabled to hear his own voice reproduced rather imperfectly, due, of course, to two obvious troublesome elements. His arc light was not steady, as the carbons continually "sputtered," imposing their foreign "frying" or "hissing" sound upon the film; and in reproducing, the element selenium was very noisy, adding foreign noises which the carbons had introduced. Of course, since this time a great deal of experimental work has been done which makes it an easy matter to classify the defects in his experiments, as is the case with most anything in retrospection. But it served its purpose with me in bringing to my attention the unlimited opportunities in further experiments.

I did not attempt to repeat this experiment until some years later, at which time I duplicated Herr Ruhmer's conditions and found that, while his invention was a scientific curiosity, the intelligibility of the reproduced speech and the foreign noises merely signalled a starting point for a new departure in sound recording to be developed for talking-moving pictures, or sound alone. To this end I became a devotee and formulated many theories or suggestive principles which would enable me to photographically record the sound, by means of various light controls, such as dynamically controlled light shutters, or highly damped galvonometer mirrors, etc., in place of the troublesome arc light. But I concluded that their very delicate nature would be responsive to the mechanical vibrations arising from the gears moving the film and would thus defeat the very purpose of their application, especially where the light recorder was to be mounted upon the moving picture camera, which had a decided vibration due to its intermittent movement.

I then realized that I was confronted with a problem of heroic proportions. The only alternative was either to improve the arc light electrodes or reduce the inertia (that is, increase the natural frequency) of the mechanical dynamic shutter or mirror, and shock-proof it from all sounds or mechanical vibrations not intended for recording. The magnitude of these considerations were suggestive of a false line of attack. After some interminable deliberation the fact that I was translating one form of energy into another, centered my attention upon the physical relationship between the two:—the subject matter of a trail of thought which "back-tracked" into High School physics, and the little remembered problem of "polarized light."

The classical experiments of Faraday, Maxwell and, later Dr. Kerr, studied with the intent of an inventor, from every available text and deference source, yielded a basic answer to an otherwise futile quest. Experiments which I later made confirmed my enthusiastic hopes, but I did not apply for a patent until some six years later, which was subsequently issued as No. 1,474,695. I had here found an inertialess light control valve which would not respond to mechanical vibrations set up by the camera, but enabled an instantaneous response of light strength change to be had from a telephone current. As it would not be the proper place to attempt to explain polarized light in this article, it may be briefly stated that when a ray of light is permitted to pass through a suitably constructed prism of calcite, it assumes a condition in which the inter-relationship of light to electricity may be optically observed by the aid of a secondary prism constructed after the fashion of the first. In actual operation a concentrated incandescent filament lamp is employed to furnish a ray of light which passes through a prism of calcite, then between the leaves of an electrical condenser immersed in a solution of carbon disulphide, and then in turn through another prism of calcite, where it finally emerges and is concentrated upon a rapidly moving motion picture film in the shape of an extremely narrow (less than .001 of an inch) but elongated image aligned at right angles to the length of the film. Any electrical current which is transmitted through the condenser causes an instantaneous change in the strength of light passing through its leaves made observable by the second prism. This changei s directly proportional to the strength of the electric current and is known as the "Kerr effect," after its discoverer. Thus it will be seen that we have here a means for valving light with an ideal characteristic.



No. 1. Various photo electric cells, "the electrical eyes of the 'talkies'," some of which are used to convert the sound shadows into speech No. 2. The Polaritron The electrostatic cell or controlling polarized light, operating on the principle of the "Kerr effect." The windows are of glass and the cell is filled with carbon bisulphide. Note the two condenser plates No. 3. The sound pick-up attachment of the "PHOTOPHONE," mounted on Powers projector between upper film magazine and projector head This is now being re-designed to mount below the Simplex projector head which has become standard with photographic sound systems. Mr Whitson at right No. 4. "PHOTOPHONE"—Whitson's device for both recording and reproducing sound photographically This experimental model was constructed nine years ago No. 5. "THE MULTIFONE"—The first "dynamic" cone speaker employed years ago. No. 6. "OCTOPHONE"—A tuned microfone "of other days"

I believe it would be appropriate here to correct some false statements now current about the application of "polarized light" made by well-intentioned but misinformed parties to the effect that the solution used in the polarized light systems rapidly deteriorates or becomes unfit for optical purposes, or that it will not rotate the light. I want to direct my readers to several accounts of the application of polarized light to television, a place where a light control valve is required having practically no inertia. These practical experiments were conducted by men of scientific eminence.

In **Science and Invention**, of August, 1922, Mr. C Francis Jenkins, who needs no introduction to those in the technical departments of the moving picture industry, is to be found an illustrated account of his television machine, clearly illustrating the polarized light schematic. In this particular case, Mr. Jenkins passed his light through the core of a spool of wire instead of the leaves of an electric condenser, which core contained a transparent glass tube filled with carbon disulphide. As a commentary here my personal experience has taught that the coil control required a great deal more current than the electrostatic principle and the coil also possessed distorting hysterises which were not present in the condenser and, in view of this, I wish to direct those interested to a very pertinent account of the application of the condenser principle to television by a prominent German radio company, the Telefunkin System, given in the **Radio News**, of November, 1926, where quite a comprehensive article is to be found containing a number of photographs of the invention, and of special interest is a transmitted photograph of Count von Arco, a study of which will show that total illumination to total extinction was obtained, demonstrating the possibility of light being perfectly controlled or valved by electrostatic action while polarized.

This principle of light control enables a most uniform light (or sound) level to be maintained by virtue of the fact that an incandescent lamp is employed under the secondary control of a rheostat, which is very important in talking moving pictures, especially in view of the fact that the photography of the scene represents one light level and the sound another light level, and both are developed together on the same film, a condition which is now the source of much concern, as it has been found that a uniform sound level is more to be exacted than the picture level.

While I have discoursed at length upon the recording principles and how I was led to a solution of the paradox by philosophical reasoning, I have yet to relate the experience encountered in the solution of the complimentary problem. It will be remembered that the background of these experiments was devoid of such auxiliary equipment as the highly improved radio amplifiers, microphones, condensers and transformers, etc, which some of my later contemporaneous workers have had the excellent fortune to possess. I had essayed the problem as a veritable pioneer on the frontier of science. And we must admit here that without the refinements of modern radio practice, we could not produce a talking moving picture with the present perfection.

However, with the inertialess light control valve which I had invented, I was still confronted with the problem of solving or designing a unit which would act in the reverse manner of the recorder for reproducing the photographed sound. To this end I realized that I must depart from the conventional practice of those who were experimenting with light controlled means for television and signal work of various kinds, as they were all then experiencing difficulty with the little understood characteristics or temperament of the element selenium.

As it does not fall within the scope of this article to explain here the action of this element, we will pass it by stating that it was the only known means at that time for an attempt at controlling electric currents by and in accordance with light impulses. This element had a way of its own of cutting up in the most unexpected manner, by introducing foreign noises which sounded in the telephone receiver like our now familiar radio enemy, "static." It would also have moments of fatigue,

in which the sound would gradually die out or increase in a very unexpected manner. In fact, anyone who has experimented with a selenium cell, especially those of an earlier vintage, could write a paragraph here in talking about the faults of this element which I will forego other than to add that I realized that the unit which must be employed for talking moving pictures would have to be free from these inherent disabilities, not only in several cases, but in all cases; that is, it would have to be like the recorder in the sense of being inertialess and responding at any and all times in just the same way, in order to faithfully reproduce what had been recorded.

I was no more fortified to tackle this second problem than the first, for in those days there were no such reference aids as the modern scientific and semi-scientific magazines now afford, and it will be remembered that 13 or 14 years ago the laboratories of the Western Electric and the General Electric were mere experimental shops as compared to their present gigantic research equipment. Likewise there were very few efficiently equipped private and academic research laboratories, and all were more or less isolated from each other, and their respective developments were not collectively known and available as they are today through the channels of a multitude of daily, weekly and monthly scientific and semi-scientific publications.

If my generalizing here is thought to be a digression, I must explain that I merely wish to visualize by reconstructing the arid field of reference which existed at that time, due entirely to lack of contemporaneous development. Some of my readers will distinctly recall the period to which I refer and will realize the amount of work required to formulate and construct an apparatus of this present character at the time. It was then through one of a few meager channels of information that I was directed to the possibilities of the "Hallwach" effect, which a French engineer had attempted to use in a light control apparatus and had found it rather promising, although its action was so feeble as to require enormous amplification which he did not have at that time.

Dr. DeForest had just been experimenting with his audion, and I recognized its possibilities in my connection and at once was impressed with the application of the "Hallwach" effect as a light control means for sound reproduction used in connection with Dr. DeForest's audions, although at this time I was using a series of Brown Telephone Relays for amplification. These relays were an English invention, operating upon the principle of an electro-magnetically controlled microphonic contact and were very sensitive. A fair degree of amplification could be obtained by the use of several in tandem, although their amplification factor was nowhere near that of the audion, and they were unable to pass enough current to operate a loud speaker, especially the loud speakers of those days.

As I have passed up the explanation of several scientific phenomena in this article, I will have to maintain the same brevity here in connection with the aforementioned "Hallwach" effect and refer to its action by relating that a German physicist of the name of "Hallwach" had conducted some specific experiments with an effect of an electrically charged body in the presence of ultra-violet rays, which had been noticed some time prior by the German scientist, Hertz, in whose honor the radio waves have been named "Hertzian waves."

Hallwach discovered that whenever the leaf of a very delicate condenser, referred to as an electroscope, was negatively charged and exposed to the ultra-violet rays it lost its charge in a puzzling manner, but subsequent experimentation by various scientific minds (see "Photo-electricity" by Allen), established the fact that this effect could be made more pronounced by the use of electrodes coated with an alkali, and in its modified form where the electrodes are enclosed and sealed in a glass sphere or tube with a certain amount of a particular gas, it has become known as a photoelectric cell. In its final shape, or studied more closely, it was found to possess an instantaneous response to light influences, had no practical fatigue, and followed the law of proportionality. It has just been determined by Professor Ernest O. Lawrence and Dr. W. I. Beams, of Yale University, that the reaction or liberation of the electrons on the cathode to a light impulse has a lag of "less than three billionths of a second."

With the development of these two photo-sound converters and the possible use of the DeForest audion, I turned my attention to the development of a satisfactory loud-speaking telephone receiver. They were anything but a success 15 or 20 years ago, and the few which had been developed had been experimentally employed in several railroad depots for announcing the schedule of trains and were almost unintelligible. The current from several storage batteries was passed directly through a hand telephone transmitter, which had been equipped with two or four carbon buttons in order to handle the heavy current, and the coils in the speaker were likewise of heavy wire for the same purpose, and the amplification depended upon the amount of current the voice permitted the transmitter to pass. That is, the strength of the voice had altogether to do with the amplification, as amplifiers in those days were something of a myth.

While I wish to avoid technical details here, I believe it will be interesting to relate how inventions are sometimes initiated. I had observed a certain type of telegraph relay in operation, which had been invented by Edison, known as the "camel-back" polarized type, and conceived the idea that if the lever were made of much lighter material and extended to connect with a diaphragm I would obtain a vast improvement over the then existing types of loud-speaking telephone receivers which are called by their various inventors resonators or enunciators. This Edison polarized principle gave me a greater and more accurate control over the moving or vibrating system and I was able to reproduce the voice with a remarkable improvement over the older principle. In fact, I incorporated this very principle in several types of radio loud-speakers which I subsequently manufactured and marketed to quite an extent as late as 1924. These were found to possess high quality when used in connection with modern amplifiers. This principle is now extensively used by radio manufacturers in the construction of cone and horn loud-speakers.

But in order to explain the development of my invention in chronological sequence, I should state that quite a few years ago I prepared some very elaborate and comprehensive working drawings and caveats of my entire assemble and entitled the invention "The Photophone." Equipped with these and with earnest visions of every theatre and moving picture studio in the world immediately accepting such an invention I started the greatest quest, or more accurately stated, conquest, of them all, for financial backing.

I was familiar with the early synchronized phonograph talking pictures of Whitman's Cameraphone, Webb's device and Edison's Kinetophone, but I fortified myself with the reasoning that I had the correct principle for talking moving pictures and had failed to reckon with a factor which is not found in the lexicon of the scientist, especially a young one, and that was the element of "opinionated humanity"—the "tombstone of pioneers." During the years of 1914-15-16 I sought the audience and financial assistance of men of influence and wealth around San Francisco, California. A list of these names which I have may be checked from the pages of "Who's Who" and it is extremely unlikely if a single one of these men, if they are still alive, will have forgotten my prophetic story of the "Photophone," now that they may enjoy Vitaphone, Movietone or "what not."

Two of the most successful are now operating upon the principle of sound photography. The war interfered with my project of financing as I enlisted for service, and, immediately upon being released, I transformed my residence to Los Angeles, Calif. and initiated an intensified campaign for financial backing among the moving picture producers. Relentlessly I pursued the man of authority in practically every studio, more persistently than any extra who ever dogged the steps of a director. My story, rather than the invention, had an entertaining value, good for two or more interviews with the same executive, for which my anxious expectations were ultimately complimented by the concluding answer that "the tired business man agreed with the Chinaman that one picture was better

than ten thousand words," or "we are playing to packed houses; why add to the equipment?" etc., etc.

However, I realize that the irony of retrospection does not add to this story, but as a finish to this vein I wish to direct that a detailed study of the principle of my "Photophone" will teach that the invention (the recorder excepted) which I laboriously sought to introduce is practically and essentially the same as the invention now known as the "Movietone" and "RCA Photophone, Inc."

The law of average is probably to be credited with the interest I ultimately secured on the part of several parties with a penchant for taking a chance and I was enabled to construct a fairly complete model embracing the underlying principles of my "Photophone" in 1920-21, whereupon we organized a "Photophone Association" and applied for papers of incorporation of "The Photophone Corporation."

But to return to the subject matter of this article: I was assisted in the construction of my photo-electric cell (which I named the phototron) by S. O. Hoffman, a physicist, who was in the science and research division of the Army during the war and who was responsible for the development of a system for the detection of enemy airplanes after dark by detecting their engine heat radiation from the ground by means of a supersensitive "thermocouple," a truly remarkable invention.

Another item of interest in my combination of inventions was the development of a cone for tonal quality, which I recognized as being much superior to a horn, a fact which has just been determined by a good many radio loud-speaker experts. Although the "exponential" horn has its claimants, I do not wish to open up any contention on this score. I constructed a dynamically driven cone for quality reproduction in 1919-20, just before the period of practical radio broadcasting was ushered in with its demands for loud-speaker considerations, and proved beyond all cavil that the dynamic cone has many points of superiority where quality and volume were both requisite, such as for theatrical purposes. It is interesting in passing to recall that the cone was not introduced into the radio field until 1924, where it made its appearance under the name of Phonotron, by the Pathe Company, and the "dynamic" cone is just a recent trade introduction and has not been employed so far by the talking picture systems.

As I have mentioned before, this development work of mine was conducted unaided by such a rich background of text and established precedent as have been obtainable since radio engineering has piled the lap of the experimenter high with valuable data and refined equipment. Contrasted with the present advantages we had to make our grid leaks with pencil marks: our transformers were not far removed from "over-hauled" door-bell affairs; our amplifier tubes were unofficially borrowed from military sources, and so forth.

While I have introduced a lighter vein in this narration, it is none the less true that my iteration and re-iteration of handicaps are not intended as an apology, but rather as illustrative of what every researcher was laboring with at that time, whether in a commercial, private or academic laboratory.

The requirements of a microphone for any purpose could not be satisfied by the ordinary telephone variety which some amateurs were then experimenting with, as they were very noisy or had a pronounced "breeze" effect. Here I resorted to the electromagnetically controlled microphone contact, very much like the principle of the Brown telephone relay which I have mentioned earlier in this article. In this case I mounted an extremely small carbon cup in the center of an iron button which was about an inch in diameter and the button was then mounted midway between two steel wires which were tightened after the manner of a piano wire and tuned to a definite pitch. A number of these were employed, each tuned to a different pitch and all connected together to an amplifier.

In this way I endeavored to divide up the musical register so that the low tones would be picked up by their respective microphone and the high notes picked up by the microphone which was likewise tuned to a high register and thus encompass the full diapason. While the microphonic principle was satisfactory the multiple tuned vibrating systems did not prove so, as they accentuated certain notes and produced interference between others and their harmonics. So I ultimately resorted to the use of only one microphone tuned to a frequency or pitch in the neighborhood of the highest note on the piano (4000 ps) and obtained a rather true response. This device I named the "Octafone," after the musical name of octave. I exhibited this device, "The Photophone," to many in 1921 and 1922 and, after exhibiting it to a newspaper man who was formerly a professor in the University of California, he wrote an extensive article about its every function, using the various designations which I had given to them, and it was published as a major news article in the Los Angeles Examiner, of July 23, 1922. This article brought my Photophone to national notice, and many publications, including those of scientific interest, investigated and published detailed descriptions and photographs of my various units.

It is altogether appropriate here to cite that, not only in creating but in appropriating a word, which should have been applied to a more active invention, I was encroached upon by others. As I have mentioned earlier I had named my photoelectric cell "The Phototron," and the word was constantly employed in many press accounts of my invention years ago, and it is now being applied as a trade name to a photoelectric cell manufactured by a New York company and advertised as such. Also, in the quest of a word for my invention I had created the name "Motiophone" for my talking-picture system, but as the word was not phonetic enough I decided to make use of the word "Photophone," a word which Bell, the accredited inventor of the telephone, had created as a name for a device which he had designed for telephoning without wires over a strong searchlight beam and picked up by a selenium cell mounted at the focus of a secondary parabolic reflector which was, no doubt, the first successful wireless telephone.

While Ernest Ruhmer, the German scientist, might claim credit here for this invention of Bell's I do not wish to make any positive statements one way or the other, but the name "Photophone" was specifically used by A. G. Bell in his patent No. 235,199, issued December 7, 1880, for the above named invention. Considering that the use of his invention was extremely limited and was never commercially practiced. I felt that in using this highly euphonious name for my invention, I would not be injuring another art, so I signalled my invention by this name for so many years (that is, since 1915) that all who came in contact with my work associated the name with it, including the numerous press accounts which were printed after I had incorporated under it in 1921.

This name was recently applied to another talking picture system and has been so heavily advertised that no end of embarassing confusion has arisen in the minds of those who are familiar with the account of my work.

While the improved model which I had been demonstrating aroused no interest in the moving picture camps, it was playing an important role in graduating others as well as myself in this new development of applied physics. Where we would be looking for some of the troubling or "parasitic" effects in the reproduction, it would invariably result in a false clue. It was first a problem to determine whether a certain noise was in the original record or being introduced after. One particularly troublesome condition which was extremely baffling at first was a noise which sounded exactly like the noise being made by the projector; yet we tested our photocell and it was found to be non-microphonic; that is, it was not acting like a microphone. If the photocell had been faulty the noise of the projector would have been picked up when no film was being run. We would turn the current on and off the cell while the projector was running with no film and no noise would develop, but the moment we introduced the sound film into place and ran it with the light shining through the reproducer, the noise would immediately occur. We knew that it could not possibly be in the record because the noise in the loud-speaker was the same noise the projector was making. Then we discovered what is now an extremely important consideration in the photographic sound system. The bearing of the driving sprocket and the interlocking gears of the projector had worn an excessive "back-lash" or loose play and, while they were turning continuously, there

was a constant "stuttering" or jerky motion imparted to the film which the eye could not detect but was picked up by the photocell. This condition was immediately remedied by the insertion of new bearings and a fly-wheel added. This modified the noises to a remarkable degree, but there was still a disturbing noise of a different character. After a careful study of many hours, yes days, it was discovered that the ball bearings were introducing a small "play." Then it was decided to remove the ball bearings of the driving sprocket and utilize a smooth friction bearing, which was done, with a further reduction of noise, but a continued study revealed that the teeth of the driving sprocket were engaging and disengaging the perforations of the film with an erratic gripping and stripping effect so small as to be almost unobservable; yet this slight jarring effect was transmitted to the film in a transverse manner and then picked up by the photocell. So when this condition was remedied, a superior effect was instantly noticeable.

These later troubles proved that the electrical and acoustical problems had really been perfected all out of proportion to the mechanical ones some years before, and the most precise machine work was really necessary to prove where the almost disheartening, apparently unsurmountable trouble occurred.

Another source of noise which proved to be mechanical was the sudden pulsations of the motor, which were finally "snubbed" or "filtered" by the introduction of a section of rubber hose in the drive shaft.

There is another phase of this invention of which I have said nothing so far, and that is the optical system. It presented some problems practically as baffling as the mechanical ones, which is really the subject matter for another article so I will forego an explanation here, but will conclude by stating that as I was still unable to secure the interest of any moving picture company up until 1926, I devoted my time to the intermittent development of these various elemental angles upon which I applied for patents, believing implicitly that evolution would inevitably bring a demand or an occasion, which fate no doubt ordained for the Warner Bros. in their epochal "Vitaphone" initiation. The effect was magical upon the adamantine picture producer, those who had told me by word and letter, "Why, the 'Talkies' would never be a success," are now speaking volumes in the press about what wonderful possibilities are now opened up by this new invention and are concluding that they have long been waiting for this opportunity.

But as "the play is the thing," the novelty will soon wear away—as it has with the radio—and high quality will be exacted by a discriminating public, and as it is "the survival of the fittest" in this newly competitive field, I wish to dedicate over fourteen years of technical work and contemplation to this ideal and let my subsequent work "talk" for itself from the moving picture screen.

J. A. Valentine, A. S. C., has been in New York City since July 28th with the Fox Movietone, working on Raoul Walsh's forthcoming big production, which is to be Fox's first big Movietone special, "Behind that Curtain."

Jimmy says—There never was a director, once a cameraman, who sometimes hasn't looked up at his cameras and thought of the little sweetheart he knew before he got married.

Mr. Valentine has signed for a long term contract with Fox to work on Movietone. He expects to return to Hollywood early in September.

Jimmy says—Photographic ability is only the grammar of the screen. It's nice to be correct; but after all, it's what you say that counts.

Accepted by All Studios

It is interesting to note the success that Mr. Max Factor is having with his Panchromatic Make-up. This new development has aroused the interest of all the industry with the result that exhaustive tests have been made to determine its qualities.

Panchromatic Make-up is the result of the tests made at Warner Bros. Studios early this year to study the effects of incandescent lights. At that time Mr. Factor introduced his new make-up and explained that it would relieve the cinematographer of all his worries in regard to make-up. It spelled the end of the useless gaudy colors that had been worn by the performer.

Panchromatic Make-up consists of pigments delicately balanced and taken from both ends of the spectrum. Regardless of film or lights it offers assurance that the subject will photograph properly. Cinematographers in many large productions are insisting that all their people use this make-up. Likewise almost every studio is today stocking and supplying Panchromatic Make-up in their make-up departments, and this is so in Europe as well as America.

In Hungary

BUDAPEST, Hungary—Teaching the young idea how to "shoot" and to take parts in moving picture dramas hereafter will be part of the task of all public schools in Hungary, according to a Government decree issued recently. The new plan includes free admission of school classes to all moving picture theatres in the country.

The Hungarian children are to be taught not only how films are made but the entire technique of writing scenarios, ranging from comedies to historical plays. This will all be based upon the most approved Hollywood practice. They also will be instructed in dramatic art as a preparation for speaking parts in the new movietone films.

Owners of motion picture theatres are required to place their showhouses at the disposal of schools without compensation.

The Man Behind the Camera

From the address of Mr. Sol Wurtzel, general manager of Fox Studios, at the dedication of the new Fox laboratory.

"During the eleven years I have been in charge of this studio, this is the first time that we have dedicated a building to an employee who was other than a motion picture director, actor or scenario writer.

"Quite too often the man who holds a position far removed from the screen is not given credit for his share of work in the finished motion picture product. The men who hold the principal positions in a motion picture studio, outside of the director, the actor, or the writer, are the men behind the camera and the men in charge of the motion picture laboratory. This building is erected to honor the men behind the camera and the men in the laboratory—the men whose work in putting the motion picture on the screen it is to see that it is photographed right and developed and printed properly.

"These men are damned more often than anyone else in the business and seldom get credit for their important work.

"I feel safe in saying that the cameramen we have on our lot are as fine a group of men as can be found in any industry, and the man in charge of our laboratory, Mr. Leshing, is as fine an artisan as any in the motion picture business. We pay honor to him and I am certainly glad to be able to voice the esteem with which we hold Mr. Leshing and our camera and laboratory personnel."

Neutral Gray Filters In Cinematography

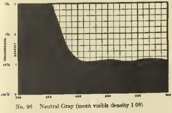
By JOSEPH DUBRAY, *Technical Editor*

The exigencies of modern Cinematography have brought about the use of "neutral gray light filters," which serve to reduce the effect of the incident light upon the film without having recourse to either the reduction of the lens aperture or the reduction of the angular opening of the camera shutter.

In other words, by the use of these filters, the exposure can be regulated at will by the Cinematographer, while maintaining the desired depth of focus and color rendition.

These filters are the **Wratten light filters, No. 96,** and bear the catalogue nomenclature of **"No. 96, Neutral Gray."**

The graph illustrates the absorption curve of such a filter having a Density of 1.8.



No. 96 Neutral Gray (mean visible density 1 08)

This absorption curve has been determined by spectrophotometric measurements and has been plotted as a **curve af density against wave length,** the **Density** being the common logarithm of $\frac{1}{\text{Transparency}}$.

For the curve illustrated, the mean density of all wavelengths is 1.08, which is a little over the logarithm of 12.

For all practical purposes it will be sufficiently correct to compute the density of this filter as corresponding to a transparency of $\frac{1}{12}$ so that it is seen that this filter transmits 1/12 of the incident light or approximately the 8%.

Since these filters may be procured of any desired density, the "American Society of Cinematographers" has chosen the following range of densities as the most appropriate for Cinematographic work:

Density .15 which transmits the 66 % of the incident light
Density .30 which transmits the 50 % of the incident light
Density .45 which transmits the 33 % of the incident light
Density .60 which transmits the 25 % of the incident light
Density .75 which transmits the 16 % of the incident light
Density .90 which transmits the 12.5% of the incident light
Density 1.05 which transmits the 8 % of the incident light
Density 1 20 which transmits the 6 % of the incident light

It is to be noted that the alternate series the different densities of which are .30; .60; .90 and 1.20 bear to each other the relation that each filter requires double the exposure of the preceeding one, in other words they correspond to the regular progression of diaphragm stops.

The other alternate series, the different densities of which are .15; .45; .75 and 1.05, not only correspond to the regular progression of the diaphragm stops as the first series but also each one of the filters corresponds to **half a diaphragm stop** when compared with the filter preceeding it in the first series.

For example suppose a scene which would be correctly exposed when photographed without filter at an aperture of F.11.3. The use of the filter Density .30 would require an exposure double the one obtained by the aperture F.11.3, that is to say the scene should be photographed at an aperture of F.8.

The use of the filter Density .15 would then require the exposure given by of diaphragm opening of F.9.2. Carrying the same reasoning for the whole series of filters, it will be found that the same scene would be correctly exposed by the use of the filter density 1.20 and a diaphragm aperture of F.2.

It is very probable that for normal cinematographic work it will be sufficient to add only three or four of these filters to the equipment of the Cinematographer, and experience will dictate the most appropriate densities but whenever trick or special process Cinematography is involved, the whole series selected will present a greater range of possible effects and therefore a greater pliability and latitude in the solution of photographic problems.

The absorption curve shown in connection with this article proves that the color rendition of the subject is not affected by these neutral filters because they totally absorb only rays which do not concur to form the image being absorbed by the glass of the lenses (wave length 320 mu) and by the color correcting filters mostly used. The slight irregularity of the curve which prove two maximum of absorption at 500 mu and 620 mu, is so gradual that no difference in color rendition is noticeable in actual practice.

These neutral filters are additive so the sum of the densities of two filters gives a very approximate value of the resultant density when the two filters are superimposed, consequently they may also be used in conjunction with the usual filters used for color correction.

The "American Society of Cinematographers" is at present discussing with the Eastman Company, manufacturers of the neutral filter, the matter of the practical nomenclature to be adopted for them.

The designation of the filters by their density involve a certain calculation for the finding of their transparency and therefore of the exposure they control; which result impractical when under pressure of time in actual production work. The most logical manner to avoid such complication would perhaps be to add to the trade name and number, the **filter factor** for each filter and to all appearances this will be the procedure which will be resorted to.

The Pan Tachar

Its Adaptability for Work with Mazda Lamp and Panchromatic Film

By Wm. F. Bielicke

[*The Astro-Gesellschaft, of Berlin, Germany, makes it a practice when putting any new improvement on the market, to submit it to prominent, practical American Cinematographers for exhaustive tests before introducing it to the trade generally. The management advises the American Cinematographer that they have found this practice greatly to their advantage as it is their "experience that the criticism of the American cameramen is absolutely fair."*—Editor's Note.]

The introduction of the panchromatic film and the Mazda Lamp into moving picture photography has made it necessary to make a closer investigation of the chromatic errors in the photographic objective. Designers of this type of lens have in general given their attention to two lines of the spectrum, the D and G' lines which lie in the yellow and the violet region. The light rays of the yellow D line have the greatest luminosity for the human eye while the light rays of the violet G' line have the greatest chemical action on the photographic emulsion. The yellow rays produce the image which is seen by the human eye when focussing and the violet rays produce the image which is produced by chemical action on the film. It is evident that if both images coincide the lens is free from color and the film image is as sharp as the focussed image. If a lens does not make the yellow and violet images to coincide it is said that the lens has focus difference. There are hardly any lenses for ordinary moving picture photography that possess this defect although some of the so called soft focus lenses are purposely made with focus difference. Such lenses produce an image that is more or less out of focus to produce the soft effect.

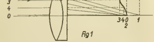


Fig 1

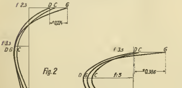


Fig. 2

Fig. 3

The correction for the yellow and the violet rays has given very satisfactory results for black and white photography on ordinary film, especially when carbon or mercury vapor lamps are used which contain a great amount of violet rays. When mazda lamps and panchromatic film are used special attention has to be given to the other colors of the spectrum, especially the red.

Lenses which give sharp images in the same plane have been used for many years by photo engravers for three color work. These lenses are known under the name Apochromats. They are, however, of very little use for moving picture photography as their speed is quite small, they work with an aperture of about f:10.

In the Pan Tachar the designer has succeeded in reducing the chromatic aberrations to a small figure for the entire region of the spectrum which is taken up by the panchromatic film, that is for light of the wave lengths from about 660 to about 400 millionth part of a millimeter. These figures vary for panchromatic films of different make.

Fig. 1 gives an explanation how the aberration curves are illustrated in the diagrams. Four Rays coming from a point lying in infinity are traced through a lens system which is corrected for spherical aberration and their crossing points are marked on the optical axis. The path of the rays is continued which is shown by the dotted lines. In the crossing points on the axis perpendiculars are erected and their intersection points with the continued rays are marked off. Through these intersection points the aberration curve is drawn. Each ray is refracted into a bundle of rays of all colors which again suffer a number of refractions in different manners when passing the various lens surfaces in a combined lens system. In this way aberration curves are found for each color. These color curves are shown in Fig. 2 for the Pan Tachar and in Fig. 3 for an older type of moving picture taking lens having aperture of f:3.5.

Below are given the distances from the last lens surface to the crossing points of a number of rays traced trigonometrically through the lens system having a focal length of 100 mm. They are given for three rays, one passing along on the optical axis of the system, another entering the lens at the edge of the full opening and an intermediate ray which enters at a point on the first surface of the lens which is on a circle which would be the edge of the free opening if the lens were stopped down to half the full aperture. For a f:2.3 lens this aperture is f:3.3 and for a f:3.5 lens it is f:5.

	Wave Length	Axis	Intermediate	Full Opening
Fig. 2. Pan Tachar red C..	656	72.260	71.908	72.423
yellow D	589	72.155	71.862	72.353
violet G'..	434	72.065	71.869	72.577
Fig. 3. f:3.5 lens, red C ...	656	82.470	81.638	82.206
yellow D. ..	589	82.313	81.523	82.242
violet G'	434	82.190	81.590	82.628

In geometrical optics it is customary to give overcorrection a plus sign and undercorrection a minus sign. Chromatic overcorrection is understood when the rays of shorter wave length have a longer crossing distance with the axis than the rays of longer wave length. Undercorrection is understood for the reversed condition.

On the diagram it can be seen that for the f:2.3 lens the full aperature rays have an overcorrection of +0.224, and the axial rays an undercorrection of —0.195. For the f:3.5 lens these figures are +0.386 and —0.280. It is evident that pictures of different color taken with the Pan Tachar lie closer together than those taken with the 3.5 lens and will therefore be sharper.

It would be of great interest to cinematographers if designers of other types of moving picture taking lenses would publish the correction curves of their lenses so that cinematographers may find out from practical tests how far the theoretical results coincide with the practical results.

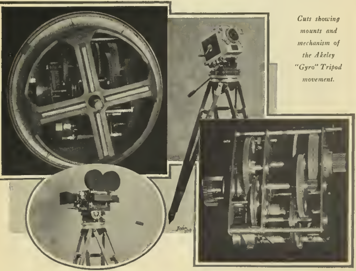
Jimmy says—When in doubt, shoot at 5.6.

Akeley Universal "Gyro" Tripod

The late Dr. Carl Akeley, while doing extensive scientific work in the Jungles of Africa for the American Museum of Natural History in 1910, found the usual type of tripod inadequate and unreliable for photographing animals or other moving objects. He set to work in designing apparatus to overcome this handicap and having found that friction devices were not satisfactory, he finally conceived the principle of the Akeley "Gyro" movement.

Prominent directors alive to the infinite possibilities of motion picture technique have for some years felt the necessity of a universally adaptable "Gyro" movement. The new Akeley Tripod answers to this need. By adding all the flexibility and precision of the Akeley pan and tilt mechanism to any motion picture camera it thereby eliminates the difficulty of matching scenes when taken by different types of motion picture cameras.

Mechanically, the Akeley "Gyro" movement is unique.



Cuts showing mounts and mechanism of the Akeley "Gyro" Tripod movement.

During the past ten years this Akeley "Gyro" movement, although designed by Carl Akeley to solve a special problem, has been found increasingly useful, in fact necessary, in all types of motion picture work—Dramatic Productions, News, Expeditions, Industrial and Scientific work, etc. So much so that after years of experimenting we have developed an Akeley Gyro Tripod upon which any type of motion picture camera can be used. This mechanism is self contained in the tripod head. Thus by adding all the advantages of the original Gyro movement to every type of motion picture camera, this new Akeley tripod unit tremendously increases any camera's efficiency.

To portray realistically any rapid or even semi-rapid movement by means of a motion picture camera requires coordination of pan and tilt speed. When using the Gyro Tripod it is possible to photograph any object, no matter how fast or how slow it may tend to move, irrespective of direction. This can only be successfully accomplished with the Akeley Gyro principle.

The adaptability of this principle to any type of camera will enable directors and photographers to place on the screen vastly different and original effects. These new effects will keep the public interest stimulated and will react to the advantage of the producer.

The usual type of tripod is operated by two crank handles, one for the tilt or vertical movement and one for the pan or horizontal movement. The Akeley Universal Gyro Tripod is operated by one handle which governs the action of the pan and tilt and enables the photographer to follow any movement regardless of direction at the same time he operates the camera, thereby making it a one-man instrument.

In incorporating this famous "Gyro" movement in a tripod and making it easily adaptable to any camera, new and important features have been added which are the outcome of years of careful study:—

(1.) The original "Gyro" Movement operated under one panning speed, whereas the New Akeley Gyro Tripod may be operated at three different panning speeds, changed by the turning of a dialed knob.

(2.) Crank handles are furnished that may be inserted through the openings in the side of the Gyro housing which will enable one to work the pan or tilt by cranking if the occasion arises. The crank handles are interchangeable in operating either the pan or tilt.

(3.) As an added precaution in straight shooting

(Concluded on Page 33)

Photography Among The Fine Arts

By Louis W. Physioc

Reprinted from The California Graphic

Photography has long been the subject of discussion, as to its relation to the Fine Arts. The world has so generally accepted "Art" as the expression of genius that we are not surprised that there should be a suggestion of jealousy among these favorites of nature in guarding the boundaries of their aesthetic realm against the invasions of a new and powerful claimant to recognition.

These claims of photography can best be appraised by a comparative study of the elements of Art—or what is more simple, a definition of the term "Fine Arts." A definition, however, is never very comprehensive without a general study of the elements that constitute the subject to be defined.

We approach the subject with the premise that Art is any form of human endeavor addressed to man's aesthetic taste, or the delight that results from an appeal to his imagination. In our effort to reduce it to a definition, we are confronted with a multitude of agencies operating together to produce what we call works of art and we must consider these, in order to distinguish between the things that are accomplished by scientific formulae and those things wrought by the same scientific elements directed by a peculiar being we call a genius, or Artist.

We have been accustomed to consider the Fine Arts in two divisions; the spontaneous, or diffusive arts, and the other, the imitative arts. Early classification placed in the first group the arts of music, singing, dancing and acting, all of which represent the spontaneous outburst of the human emotions, with their concomitant effect on the beholder. In the second group are painting, sculpture, architecture and poetry. The first group were so classified because they carried with them a certain sadness in the fact their benefit to posterity was effected only by tradition or the fame of individual artist; whereas, the second enjoyed the more satisfying rewards of permanent records, canvases, marbles and bronzes, noble edifices, the printed book, etc. The age in which we live, however, has changed this classification entirely, for, even at an early date, music was recorded for the benefit of succeeding ages, the phonograph has preserved the glory of departed singers and even the motion picture perpetuates the dance and dramatic gesture. No longer, then, can the imitative arts claim superiority by virtue of perpetual record.

Beauty in Mechanics

In the present age, we also find science and mechanics developed to such a degree that the purely useful arts are rapidly encroaching on the sacred precincts of the Fine Arts. We begin to see in beautiful automobiles, graceful aeroplanes, mammoth locomotives and floating cities something that more nearly arouses the spiritual and emotional in us than merely exciting our admiration. After all, what more can art do than inspire a reverence for the nobility of the mind of man—the manner in which he marshals the forces of nature. Why, then, should we hesitate in admitting to the sanctums of art this new candidate for glory, Photography.

Champions of the Fine Arts jealously endeavor to maintain a position independent of any relationship with the useful arts that express themselves through the agencies of mechanics, mathematics or the sciences. They, rather, hold to the exalted idea that the Fine Arts are the expressions of individuals peculiarly endowed by nature—a spiritual gift or instinct to divine in nature beauties and truths hidden to the common mind, and that it is the sacred mission of the artist to inspire the commonalty with a love of these things by offering them idealized representations of natural beauty. To teach them to look for beauty in all things—to revere the genius who may scrape the mud from a wallowing pig and model it into some form divine—some Rubens, who may pluck the bristles from its back and fashion them into a brush with which he covers an immortal canvas—some Schubert, who catches its deep bass grunt and conceives the ringing monotone of some great symphony.

The artist contends the Fine Arts constitute a complication of elements that cannot be analyzed and that the selection and manipulation of these elements is governed by an innate sense. With this argument, they are inclined to place photography among the useful arts. They further fortify their position by citing the widespread popularity of the kodak and that the very number of its devotees precludes its claims to art. But, we believe, that among the hosts of students of the arts, there are many who have no greater claims to art than some of our acknowledged photographers. We cannot deny, however, that the painter, for example, who has spent years of toil with pencil and charcoal and many more years with paints and brush before being able to render a worthy representation, should resent a comparison with the school girl who snaps her picture and takes it to the corner drug store to be developed.

But this same artist must not overlook the fact that the school girl, with the aid of the pantograph can reproduce, in a few minutes, and very accurately, an outline that has required years of study in attaining sufficient skill to execute the original.

Reducible to Mathematics

No matter how much it may violate our aesthetic nature, we cannot deny the fact that all works of art are the final result of certain formulae capable of being reduced to scientific and mathematical statements. Let us consider them individually. Music is based upon one of the most profound systems of mathematics; singing requires as rigorous a training in vocal gymnastics as experienced by the announcer in a railway station; dancing demands the same strenuous physical training as the acrobat; painting is founded on the principles of two well defined branches of science, physics and chemistry; architecture involves mathematics in every application; sculpture embraces geometry, anatomy and poetry (writing, in general) presupposes a perfect knowledge of the rules of grammar, rhetoric, etc.

Now, despite the attitude of the artist, any bright student can master these rules, but what distinguishes them as artists is the degree of balance between this training and that inherent taste in employing it. We are furnished many instances of the importance of this combination. We are told that Schubert was hampered by limitation in his technical knowledge of music. Great as he was, he suffered a difficulty in inscribing his greatest ideas. Who knows to what heights he may have soared had he possessed that perfect technical ability of our modern Victor Herbert? Many of the greatest colorists were crude draftsmen and many great literary works can be corrected by high school students. If a painter or sculptor adopts, for his subject, the human figure, it is a peculiar sense or feeling which enables him to furnish his ideal without straying so far from proportions in form and color as to violate the effects of common observation, or avoids following so closely the demands of his scientific training as to make his work look like that of a professor of anatomy. This refined ability is what we recognize as the artist, and furnishes his strongest argument in insisting on placing photography among the useful arts, or the "literalists," among whom there can be none of that idealism which excites the emotions or inspires a keener appreciation of the beautiful. This, they contend, is due to the preponderance of the purely technical elements, in photography, over the possibilities for aesthetic expression. But allowing this, in favor of the zealous champion of the Fine Arts, it has been admitted by some of our greatest authorities that many of the useful arts, based upon purely scientific or mechanical principle, have attained such aesthetic proportions as to inspire, more nearly, a reverence as works of art than merely admiration of industrial excellence.

As to Photography's Position

The foregoing considerations, while very limited compared to the magnitude of the subject, may, at least, furnish us sufficient material to work out a comparative survey of the position of photography among the Fine Arts.

(Concluded in October)

Vitacolor Is Born

A Member of the A. S. C. Demonstrates a Method of His Own Invention in the Field of Color Cinematography

By John W. des Chenes

[The American Society of Cinematographers is proud to number Mr. Du Pont among its most faithful members and wishes him continued and well merited success. The technical editor of The American Cinematographer *could not, to his profound regret, be present at Mr. Du Pont's demonstration, but since he has seen Vitacolor pictures several times during the past two years or so and since he has followed with great interest the inventor's work, trials and successes wishes to pay here a tribute of admiration to Mr. Du Pont's achievements. For good and sufficient reasons it is not advisable just at present to give public circulation to the intimate technical details inherent in this revolutionary advance in the art of cinematography, but such details* The American Cinematographer *will publish as soon as authorized to do so by Mr. Du Pont.*—Editor's Note.]

Max Du Pont, *A. S. C.*

On the night of Tuesday, August 21, a small group of scientists, newspapermen and film representatives gathered in a barn-like projection room at the rear of 5522 La Mirada Street, in Hollywood, and witnessed the dawning of a distinctly new era in the development of motion pictures.

At first a murmur of incredulity arose from the little throng as there was awaited the moment when the lights would be darkened and there would be flashed upon the silver-screen out front the first convincing message that the movie industry has long, and sometimes doubtfully, awaited. Later they dispersed in open amazement, half unable to believe what they had seen; yet knowing, withal, that they had been privileged to stand upon the threshold of something infinitely great.

With the first rhythmic whirring of the projection machine and darkness there came a scene which was rather breath-taking. It showed a deep-green stretch of the sea, from the edges of which issued long, foaming breakers. And fighting to hold ground in the back-rush of the waters were animated figures in green, red, yellow, blue—almost every color of the Iris. And in the background a sky of the purest cerulean blue.

Every doubt of the watchers was swept aside after that, even as the sea in the projected pictures was washing aside particles of sand in the path of its forceful sweep.

"Look at that," cried one spectator, "**blue**!"

"And **yellow!**" another chimed.

They sat back in awed silence then to watch one colorful scene after another — the Monterey Coast at early morning with a high fog obscuring the sun, revealing the soft color tones of the old masters; a brilliant sunset over the Hollywood hills; an interior taken at night, with no other lighting than incandescent bulbs hidden in brilliant-hued Oriental lanterns; pictures in natural color of the Herbert Hoover notification ceremony at Palo Alto; subdued tints; vivid hues.

Later they were treated to the spectacle of seeing some of the same pictures, which had been reduced to 16 m.m. film, shown upon a small screen.

And at the end, Max B. Du Pont, a modest, self-effacing chap, a "first cameraman" and a member of the A.S.C. came forward to explain in simple terms his invention of Vitacolor, which has paved the way to possibility for unrestricted natural color motion-pictures for professionals and amateurs.

First he showed them the film from which he had just projected colored pictures upon the screen. It looked like any other exposed black and white panchromatic film. He next let them view patented attachments which fit upon the projection machine and the camera—two diminutive articles which hold the secret of Vitacolor.

"You don't mean to tell me that making Vitacolor pictures is as easy as that!" exclaimed a newspaperman present.

He was Don Roberts, star writer and photographic authority of the Los Angeles **Record**.

After being assured that it "was as easy as that," Roberts repaired to the **Record** office and wrote a yarn predicting that Vitacolor would revolutionize the movies. And he wrote with a conviction and logic that was startling. A chap named Livingstone declared, in the Los Angeles **Times** that Du Pont's new process was the only color method practicable for news reels, talking pictures and other photographic subjects.

And just to add the last note of authenticity, two scientists of the California Institute of Technology, Drs. Alexander Goetz and E. H. Kurth, endorsed Vitacolor in glowing terms. Both have worked toward the solution of colored motion-pictures for years without complete success.

But perhaps it would be interesting to read a brief, technical description of the new process couched in the inventor's own terms.

"Our method," says Mr. Du Pont, "aims to impress on the emulsion of a standard panchromatic film the various colors of the scene, landscape or other picture being photographed in substantially the same manner as the artist blends his colors in painting a picture. (Du Pont, by the way, is the son of the famous, deceased landscape painter of France, Leon B. Du Pont, the last disciple of the celebrated Harpignies school of painters.)

"That is to say, we use an arrangement of special filter units which co-operate in recording the color vibrations reflected from various objects through a special arrangement of color filters of a determined wave-length transmission.

"To succeed in reproducing a true-color sensation to the eye, I was forced to work out a method whereby all of the conditions which attend the natural transmission of color vibrations are preserved intact insofar as it is possible, this being necessary if the result is to appear natural on the screen, since, in the projection room, nearly all natural conditions are perforce removed. If

(*Concluded on Page 27*)

A Non-Intermittent Projector

By Dr. Paul Hatschek

The most important advantages of the optical equalization apparatus over the existing cinema projectors with Maltese cross, intermittent picture advance and wing shutters are: Continuous or steady unrolling of the film band and elimination of the rotating wing shutter. The perforations are no longer damaged, and the picture "stands," whatever he the tempo in which it is shown. On the other hand, films with strongly damaged perforations, which can no longer be shown at all on Maltese cross apparatus, can be shown in a perfect manner on optical equalization apparatus. The elimination of the wing shutter does away in its turn with the last traces of flickering and substantially improves the quality of the projection.

In spite of these very great advantages, there would be no object in exchanging the existing very good Maltese cross apparatus which are good value for the money, for such optical equalization apparatus which are expensive, complicated and unwieldy. The new optical equalization apparatus described in the following, is, however, simple, cheap, takes up little space, and can be manufactured on the mass production scale and repaired in any country of the world by "medium" workmen.

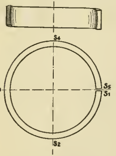


Figure 1

The most essential part of it is a ring mirror of a peculiar shape which is shown in Figure 1 partly in section and partly in perspective and which in the following will be simply called a "helical mirror." In its present construction it is a hollow mirror in the form of a nut of an arcuate cross-section.

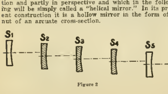


Figure 2

Figure 2 shows the helical mirror from the outside, with four sections through the same.

If we assume in accordance with Figure 3 that a film picture 1 is contained in the interior of the helical mirror in such a manner that its image appears at B, only a small portion of the helical mirror being utilized for the reflection, while the larger portion is closed by a shutter. If we turn the helical mirror about its axis

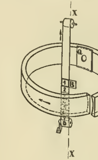


Figure 3

to the extent of one revolution (the film picture 1 remaining stationary), then the various mirror sections (compare Figure 2) will pass behind the shutter opening and will he utilized successfully for the reflection or formation of image.

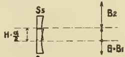


Figure 4

In accordance with Figure 4, we can arrange the pitch of the helical screw G 1 and the distance of the film picture from it, g, in such a manner that during one revolution of the mirror the image will be moved exactly to the extent of the height of the film picture—19 mm. Consequently, with the film picture G standing still, its image which first coincided with G, will be moved to B 2 during one revolution of the mirror. This will be for instance the case when G, and therefore also the image B 1, B 2, is in the double focal width of the mirror, and the pitch H of the helical screw is equal to half the height of the film picture, that is to say to 9.5 mm.

On the other hand, when the helical mirror is standing still, the image moves to the extent of 19 mm., but in the opposite direction when the film picture moves from G 1 to G 2 (compare Figure 5).

If, therefore, we unroll in Figure 3 the film band to the extent of 19 mm. in the direction of one arrow, and at the same time turn the helical mirror in the direction

Figure 5

of the other arrow once about its axis X, then the two movements of the image in the opposite direction, caused thereby, will cancel each other, and the picture will stand still, viz. the optical equalization has been effected.

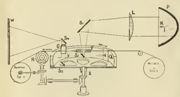


Figure 6

Figure 6 shows diagrammatically the arrangement of an optical equalization apparatus by means of a helical mirror. The light radiated from the carbon crater K is projected by the parabolic mirror P in parallel rays against L which "converges" it. The converging beam of light passes, after reflection by the flat mirror S1, through the film window F. The flat mirror S2 reflects the film pictures passing through the window, towards the shutter opening O of the helical mirror. Owing to the coupling of the film transport roller R to the helical mirror spindle X, the above described rectilinear movement is produced, consequently the stationary images of the film pictures will appear in the original size in the shutter V, the preliminary image shutter. They are magnified and projected to the projection wall W by the flat mirror S3, the lens O and the flat mirror S4.

Figure 7

The photograph in Figure 7 (taken some months ago and already out of date as regards details) is merely intended to show the small size and the simple construction of the apparatus. It goes without saying that horizontal film drums are provided so that the apparatus can be charged with at least 1.000 meters of film.

From the optical point of view, it must be pointed out that the well-known optical mathematician, Dr. F. Staeble (Munich), who has been our collaborator since the middle of 1927, has calculated the mirror dimensions for which the image corresponds to that of an achromatic lens. A counter-lens, also calculated by Dr. Staebls (arranged at the point marked with a cross in Figure 7), supplements the hollow mirror to an object glass or lens, the quality of which complies with the severest demands of the projection optics.

As shown by this description, the mechanical part of the present apparatus is even simpler than that of the Maltese cross apparatus. Only one single part, the ring mirror, requires for its manufacture a new machine, the construction of which is shown in photographs 8 and 9.

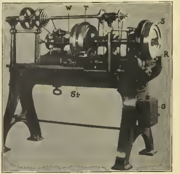


Figure 8

It is a kind of a lathe with lead screw, with an entirely automatically operated grinding spindle on which a blank of compressed glass (retail price 10 Mk. each) can be ground and polished in about 30 working hours. One man (lens grinder) can attend simultaneously to several lathes. The silvering is effected by a special process and is very durable as the ring is coated in the apparatus on all sides. Of course re-silvering could be done as often as desired and costs about 3 Mk. A spare ring could be supplied with each apparatus, in view of its small cost, and easily exchanged in 3 to 5 minutes by any demonstrator.

The preliminary work and the building of the first experimental model began already in 1922/23, whilst the grinding machine shown in the picture and the cinematograph apparatus have been working already for two years.

The problem of the mass production of the mirrors was solved in 1926, and large, perfectly steady wall pictures could be projected. The subsequent work was merely in connection with the optical improvements already referred to in the foregoing, as well as in connection with preparation for factory adjustments.

Although the patents applied for and granted for the invention in Germany, in the most important European and American States have been in existence for some years, the future manufacturer of the apparatus will be able to utilize the full period of the patent, as new basic claims have been worked out and filed.

The German patents are in the name of J. Bachmann & Co., G.m.b.H., in Leipzig, all the other patents in the name of the inventor, Dr. Hatschek, of Leipzig. As a matter of fact, all the rights belong to the above-mentioned Company, an offspring of the firm of Koehler & Volkmar A. G. & Co. of 10, Hospitalstrasse, Leipzig.

Any letters should be addressed to it, for Sr. Starkloff, or to the address of the inventor, Dr. Paul Hatschek, Fockerstrasse 43 III, Leipzig S 3.

The firm is neither cinematograph manufacturers, nor has any connection with the cinematograph branch. It has workshops for the manufacture of physical apparatus and has merely financed the building of experimental models in order to sell the patents and apparatus to one or more special manufacturers after completion in principle. The sum of all the experience gained in practical and theoretical respects is embodied in three persons: Dr. Hatschek, Dr. Staeble and lens grinder Erich Martin, of Leipzig, at present in the employ of Koebler & Volkmar A. G. & Co. By taking these three persons, who at the time would have accepted it, into the service of the manufacturing firm, frictionless working would have been guaranteed. The mechanical work can be done by any desired machine tool firm, whilst the mirror grinding can be done by lens grinders of "medium" ability who could be easily trained by the inventor and by the lens grinder, Martin.

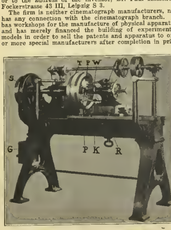


Figure 9

It would lead us too far at this point to describe the future prospects of the development. It must be merely mentioned that the inventor has projected on the same principle, but on a considerably reduced size, an apparatus for taking pictures, and his theoretical and practical work led to the result already admitted by the experts, that it is possible to economize 50% of the world requirements in raw films.

Transition processes created by him render possible realization of the project, which can otherwise be scarcely thought of on account of the world regulation.

Jimmy says—What a wonderful thing it would be if producers would permit this title to be cut into productions: "The following scene was shot under very unfavorable conditions; but we HAD to finish."

Elmer G. Dyer, A. S. C., began August 16th on a picture with Hoot Gibson, entitled "The King of Rodeos."

All First National's sound pictures will be made in the West, and technicians are now busily preparing the equipment and stages for them.

Cowling Films "The Golden Gate"

Herford Tynes Cowling, A. S. C., just recently completed "The Golden Gate," a motion picture album and travelogue of San Francisco and vicinity.

"The Golden Gate" was made personally by Mr. H. T. Cowling, Technical Director of Eastman Teaching Films, Inc., a new subsidiary of the Eastman Kodak Company, assisted by a brother A. S. C., Mr. Perry Evans. It has behind it the unlimited resources of that organization. Mr. George Eastman decided some years ago that the possibilities of so-called visual education would not be realized until someone with ample means and knowledge of the field pioneered the way. Accordingly he established a "Teaching Film Department" in the Eastman Kodak Company, in charge of Dr. Thomas E. Finegan, a distinguished educator whose record as head of the department of education of the State of New York and later of Pennsylvania had won for him the complete confidence of teachers throughout the country.

San Francisco is one of five cities and the only Pacific Coast City thus far selected for filming, the pictures to be used throughout the country in teaching geography. While in San Francisco Mr. Cowling made preliminary arrangements for sending a member of his staff to California to make another picture on "The Overland Route." This film will be used in teaching both history and geography. A third Pacific Coast picture for which he is preparing will have the "Oregon Trail" for its subject.

Mr. Cowling's record as a photographer assures an exceptionally fine picture. For some years he took all photographs for Burton J. Holmes, the travel lecturer, and he was later engaged by the National Park Service to make the best possible official pictorial record of the national parks.

A Technical Bureau

At a meeting of the Technicians' Branch of the Academy of Motion Picture Arts and Sciences, held on Wednesday, August 8th, it was announced by Mr. Fred Beetson, executive vice-president of the Motion Picture Producers Association, that the first gesture toward the establishment of a research laboratory in Hollywood had been made by the producers in their order to organize a technical bureau. Mr. A. J. Ball, of the Technicolor Company, has been named as head of the new bureau.

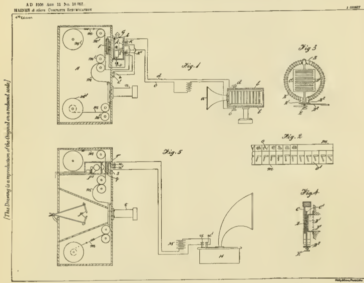
In commenting upon the announcement, Mr. Ball pointed out, says the August Bulletin of the Academy:

"That the motion picture industry had now put itself into harmony with other great industries in the matter of research, but that no sensational developments need be expected immediately. He cited the Eastman Research Laboratory established many years ago which had been able to effect material accomplishments only in recent years. There was also this difference with the motion picture industry that it does not manufacture the tools and materials with which it produces motion pictures. It merely uses for the creation of entertainment those tools and materials which are manufactured by others, and it is in these other manufacturing plants that research laboratories have been and will continue to be most valuable.

"In referring to the development of sound synchronization Mr. Ball declared that there was now the same room for advancement that existed years ago in the silent pictures and he predicted that in five years from now we will observe astonishing quality improvements in every particular of sound pictures."

Who Invented Talkies?

Mr. Eugene Augustin Lauste, of Bloomfield, New Jersey, Presents His Claims--Full Text of His Specifications--Documents in Evidence.



On August 11, 1906, Eugene Augustin Lauste, a Frenchman, made application for a patent on an invention which his solicitors described in their provisional specification as "A NEW AND IMPROVED METHOD OF AND MEANS FOR SIMULTANEOUSLY RECORDING AND REPRODUCING MOVEMENTS AND SOUNDS."

On August 10, 1907, Lauste's complete specification was accepted. The number of the specification is 18,057 on the record of the British Patent Office and is dated A. D. 1906. It follows complete:

Complete Specifications

A New or Improved Method of and Means for Simultaneously Recording and Reproducing Movements and Sounds

We, Robert Thorn Haines, Scientific Expert, of 26, Osnaburgh Street, Regents Park, London, John St. Vincent Pletts, Electrical Engineer, of "Ivanhoe," Clarence Road, Teddington, Middlesex, and Eugene Augustin Lauste, Electrical Engineer, of 64, Strand, London, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement and accompanying drawings.

This invention relates to a new or improved cinematographic and phonographic method or process and to means for recording and reproducing simultaneously the movements or motions of persons or objects and the sound produced by them

Hitherto it has been proposed to simultaneously record and reproduce animated scenes and sounds by means of combining photographic and phonographic apparatus, but without success owing to the difficulty of ensuring perfect synchronism, and the object of the invention is to provide an effective method of, and means for recording the simultaneous movements or motions of persons or objects and the sounds produced by them, so that the impressions of the movements will be recorded simultaneously with the impression of the sound waves, and will be reproduced simultaneously and in exact synchronism with them, and so that the sound waves will not suffer any variation or modification in the process of recording and reproducing, but when reproduced will be similar in every respect to the original sound waves and will therefore reproduce precisely the same sounds.

It is essential to the correct reproduction of the movements of the persons or objects in combination with the sound waves, that the simultaneous movements and sounds should be recorded and reproduced simultaneously in exact synchronism, and that the sound-waves which constitute the sounds should not suffer any variation, alteration, or modification, in the process of recording and reproducing, but should be recorded and reproduced alone and without the introduction or accompaniment of any other sound waves.

It is obvious therefore that no true record or reproduction of the sound waves could be made by any mechanical process or means in which a hard substance necessary to make the impression comes in contact with another hard substance, such for instance as the recording or reproducing pin of the phonograph or gramophone, because the friction caused between the two hard substances itself creates vibration or sound waves which accompany, vary, or modify, the sound waves which it is desired to record and reproduce, and are recorded and reproduced with the latter, proving detrimental to their true reproduction. The record therefore must be taken or produced without any contact between the medium caused to vibrate by the sound waves and the record or recording substance. It is further obvious that if the impressions of the movements and sounds were recorded separately on separate records or recording substance or material, the movements and sounds would be liable to vary in

point of time and fail to synchronize with each other. In order to avoid this liability and ensure correct synchronism, the movements and sounds must be recorded simultaneously on the same record or recording substance or material.

The essential feature of our invention is an arrangement or means for obtaining as perfect synchronous reproduction as possible of the movements of the persons or objects as well as the sounds simultaneously produced by them.

By our method as hereinafter more particularly described we transmit the sound waves electrically from the place where the sounds originate to the place where we desire to have them recorded, and we record them photographically in varying degrees as to area, quantity, intensity, and corresponding effect of light and shade proportioned to their period and amplitude, simultaneously with the recording photographically of the impressions or photographs of the successive movements of the objects, on separate parts, or in separate positions, of one or the same transparent medium or recording substance or material, and when such record is obtained we reproduce it by causing light to pass through that portion of the medium containing the record of the impressions, and so project them on the screen, and simultaneously cause light to pass through that portion of the medium containing the record of the sound-waves, to a cell of selenium or other suitable substance by which the varying degrees of light and shade of the record are converted into corresponding varying electric currents, which are so transmitted to the place where it is desired to reproduce them, and are there converted into vibrations by a suitable vibrating medium which reproduces the sound waves.

For the purpose of carrying out our invention we employ the following essential features in combination, suitably arranged relatively with each other

1. A receiver or arrangement for collecting or receiving the sound waves to be transmitted.

2. A telephonic or microphonic transmitter to transmit the sound waves in electric circuit with a suitable telephonic receiver

3 A telephonic receiver to receive them

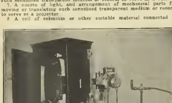
4 A source of light and a screen operated by the telephonic diaphragm so as to vary its intensity or the intensity of the beam of rays emanating from it, or a mirror to alter or vary the direction of the rays of light

5 A sensitised transparent medium or record for receiving the photographs or impressions of the movements and sounds.

6 A combination of mechanical parts for moving or translating such sensitised transparent medium or record, to serve as a camera.

7 A source of light, and arrangement of mechanical parts for moving or translating such sensitised transparent medium or record, to serve as a projector

8 A cell of selenium or other suitable material connected in



First camera made by Eugene Lauste for recording photographically sound waves. The light used was acetylene or incandescent lamp

proper electric circuit with a receiving or reproducing telephone instrument, for transforming the light, varied by the varying light and shade of the record into corresponding electric currents, and transmitting them to such receiving or reproducing instrument

9 A telephonic receiving and reproducing instrument to receive the electric currents and convert them into vibrations and again into sound waves.

10 A horn, or spreader or other arrangement for amplifying or increasing the loudness of the sounds

There are various different forms and methods of using each of these essentials, which may be conveniently employed, and which we may prefer to substitute for and use in combination with any of the other essentials and we do not therefore confine ourselves to the particular methods or parts described to be used in combination with any of the other essentials.

We will proceed to describe the method or process and means for carrying it out, together with various alternative means which may be conveniently employed therewith

The accompanying drawings are in illustration of our invention, Figure 1 being a sectional elevation shewing an arrangement of apparatus for collecting or receiving the sound waves to be transmitted and a transmitter to transmit the sound waves in electric circuit with the receiver

Figures 2, 3, and 4, shew parts of the apparatus on a larger scale and hereinafter more particularly described

Figure 5 is a part sectional elevation of the reproducing apparatus

The sound waves as well as the motions or movements of the objects which produce them are necessarily at a considerable dis-

tance from where the record must be taken, and must also be reproduced at a considerable distance from the record; it is therefore essential to provide a means of receiving the sound waves and transmitting them to a recording instrument, and a means of transmitting them from the recording instrument and reproducing them at a distant place.

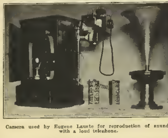
For the purpose of collecting or receiving the sound waves we prefer to use a microphonic transmitter such as at present used for collecting the sound waves at concert or music halls for transmission, or we may use one or more horns or trumpets a connected with any ordinary loud sounding telephone or microphone transmitter h which receives the sound waves and transmits them to the receiving instrument.

Whatever form of transmitter may be used we connect it in circuit (c, d) with the receiving instrument A.

In the drawings we have shewn a magnet B connected with the terminals K, K1, the varying electric currents from the transmitter h operating a diaphragm C1 having openings D1 and arranged to more or less uncover openings D in a corresponding fixed diaphragm C. This arrangement is clearly shewn in Figures 3 and 4 in which B is the magnet, D2 a spring contact carrying the movable diaphragm C1 operated by the varying strength of the magnet by the varying currents through the terminals from the conducting wires B1 B2; F is a light guard through which the light from a light source j (Figure 1) is directed. h is a reflector contained in a dark chamber l. G is a glass or mica screen through which the light passes to the diaphragm. It will be seen that in exactly the same proportion of variation in the attractive force of the magnet due to the variation in the electric currents so the amount and intensity of the light permitted to pass through the vibrating diaphragm will vary. This diaphragm and its openings can be adjusted more or less by the screw E.

There are various means of varying the intensity of the source of light or the beam of rays of light, which may be conveniently employed.

We may prefer to use a lamp of great illuminating power having air supplied to it by a pipe which communicates with the diaphragm of the receiving instrument, so that when the diaphragm is caused



Camera used by Eugene Lauste for reproduction of sounds with a loud telephone.

to vibrate by the electric currents the amplitude and rapidity of the vibrations being proportioned to the sound waves the pulsations of air transmitted to the lamp cause proportional vibrations of the light. A reflector may be used for reflecting or directing the rays of light, and a lens or lenses for concentrating or condensing the light and bringing it to a focus.

We may prefer to vary the beam of rays emanating from the source of light by using a reflecting mirror which is caused to vibrate by the diaphragm or vibrating medium of the receiving instrument and reflects a varying beam of light through a lens or lenses into a dark chamber arranged as a camera.

Or we may prefer to employ as a means of changing a beam of light or other radiant energy into vibrations corresponding to sound waves sensitive jets of air, gas, water or other fluid, or we may prefer to use an oscillograph for the purpose, or any other known method of converting variations of current intensity into variations in light intensity, where the quantity or quality of the bundle of rays is controlled according to the variations of the current, may be used.

Whatever particular method or means may be employed by us for varying the light source or the rays of light emanating from it, we direct and control the light so that the variations and its intensity which correspond with the sound waves and the electric currents, will impress themselves photographically upon a sensitised transparent medium so that the impressions so made will proportionately correspond in some particular characteristic or form with the varying intensity of the light, the varying electric currents, and the varying sound waves.

For instance the impressions may be made in varying degrees of opacity and transparency or light and shade, so as to correspond with the sound waves.

They may take the form of lines or dots of varying width or sizes or varying distances apart.

Or they may take the form of a varying spiral or varying wave lines, or of an opaque bend varying in width so as to vary the proportion of transparency and opacity, or any other form which may be desired.

Within the dark chamber or camera a sensitive photographic film m (Figure 1) wide enough to receive the photographic impressions of movements of the objects and also the impressions of the sound waves, side by side, is arranged to be translated by any suitable mechanism m1 such as is usually employed for translating the films in an ordinary cinematographic camera.

The film is operated so that one part is translated continuously past a narrow slot or other suitably shaped opening in the chamber opposite the side where the sound waves are to be recorded, and the other part is translated intermittently past the lens n as in an ordinary cinematograph camera.

By this means it will be seen that the record of the sound waves will not be exactly opposite the picture of the simultaneous movement but at a short distance from it,—although we may prefer to place the record of the movements and sounds in other positions relative to each other.

The record of the sound waves thus made on the right or left hand side of the film, and the photographic impression of the motions or movements of the objects is photographed or taken simultaneously on the right or left hand side of it, side by side, so that the first of the sound wave impressions will commence at a convenient distance from the first of the impressions of the motions or movements so as to allow a loop to be made in the film (as shewn in Figure 1) in order that one part may be translated continuously and the other part intermittently.

In Figure 2 a indicates the sound waves upon the film and a1 the photographic impressions.

The record thus taken of the sound waves consists of a continuous series of photographic impressions of light and shade varying in degrees of transparency and opacity corresponding with the variations and the quantity or quality of intensity of the beam of rays of light reflected or allowed to reach the film, or it may consist of, or be made to take such other form as may be desired.

Instead of using a strip of transparent sensitive film or medium for receiving the record, a sensitive circular plate of transparent material may be employed and caused to rotate by suitable mechanism and to move or change its position so that a fresh surface is presented to the light at each revolution, and the photographic impressions of the sound waves and motions or movements of the objects will be photographed in the desired positions in series on its surface. L, L1 are terminals to which an ordinary telephone attachment is connected so that facility of inspection as to working correctly is insured.

Or the record may be made or photographed on an opaque plate having a polished surface and reflected from it, or reflected from it by a polished surface.

We may prefer to use a transparent cylinder or some other form of record.

For the purpose of reproducing the record thus produced we employ an instrument for translating the film similar in every respect to the former instrument described, but not enclosed in a dark box or chamber.

These are various bodies or substances whose electric conductivity is varied by the rays of light which fall upon them from the sun or other sources of light. Certain substances when exposed to light waves or radiations have the property of presenting a decreasing resistance to the passage of an electric current as the intensity of the radiation increases, and other substances have the property of presenting an increasing resistance to the passage of electricity as the intensity of the radiation increases. We may employ any of the substances of either of these classes, for the purpose of converting the various degrees of light or shade, which correspond with the sound waves, into varying electric currents, and transmitting them for reproduction at the place required.

Any variation in the quantity or quality of the intensity of the radiant energy falling upon them alters their conductivity or resistance.

We prefer to use selenium prepared in a cell so as to become most sensitive to the light rays, or have its electrical resistance or conductivity altered or varied to the greatest extent by the light falling upon it.

This cell is arranged in circuit with a loud sounding microphone or telephone H (Figure 5) having a suitable source of electric current M and fitted with a horn or trumpet for amplifying the sounds. Or we may prefer to use a diaphragm which will vibrate and effect changes in a gas, oil, or other flame, connected with a horn or trumpet for amplifying the sounds, or we may employ any other suitable means of reproducing the electrical variations produced in the current through the selenium cell.

To reproduce the sound waves and impressions of the motions or movements of the objects, the film m or record is placed in proper position in the reproducing instrument with a suitable source of light p placed behind it so that the light will project the pictures on the screen and at the same time another light p1 is placed so as to pass through the portion of the film containing the record or photographic impressions of the sound waves, and also through a lens q if desired, which may be interposed between the light and the selenium cell r for concentrating the rays which pass through the film and on to the selenium cell. s is a heat absorber placed between the selenium cell and the film. When the film is translated at the proper speed the pictures will be projected upon the screen by the projecting lens t of the instrument, and simultaneously the light passing through the film will be caused to vary in quantity, quality, or intensity, by the varying degrees of opacity and transparency or other forms or conditions of the photographic impressions on the film. Such variations in the quantity and quality of the intensity of light will correspondingly vary the electrical conductivity or resistance in the selenium and transmit the corresponding varying current through the terminals u, u1 which will produce corresponding vibrations or variations in the microphone H so producing vibrations which produce the original sounds.

The sounds may be used to cause variations in light and in a cell of selenium or other substance used to transmit the sound waves in electric currents to the receiver.

Any of the means of varying the light source or rays emanating from it as described for the recording purpose, may also be used for varying the light for the purposes of reproduction.

It is obvious that any suitable form of cinematograph mechanism may be used for translating the film, and that any desired arrangement of the pictures and record of the sound waves on the film or other medium may be used.

Instead of a microphone, where varying musical or other sounds have to be collected from a stage or the like and transmitted to the camera where they are used to effect the light in the manner described a number of conical or other chambers may be arranged in suitable positions having their outer open ends closed by india rubber or other suitable vibrating material and having tubes leading from the smaller ends of the different chambers converging to one larger tube which transmits the vibrations to the gas or other lamp which is affected by their vibrations in the manner required.

We are aware that it is not broadly new in apparatus for recording and reproducing the sounds produced by the human voice or otherwise to employ a beam of light directed through a vibrating opaque screen containing a number of narrow slits and arranged parallel with a similarly slotted fixed screen on to a sensitive film mounted upon a transparent medium such as glass or a travelling sensitive strip for photographically recording such sounds. These photographic impressions being subsequently developed and fixed are reproduced by directing a strong beam of light so as to follow the direction of the photographic record and thence penetrate a receiver of selenium or other substance having the property of varying its conductivity of electricity in proportion to the degree of light to which it is exposed. Also that it has been proposed to arrange such receiver in circuit with a constant source of electricity as well as one or more telephone receivers.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1 A new or improved method of and means for recording and reproducing simultaneously the movements as well as the sounds produced by existing things or objects, the cinematographic and phonographic operations being synchronously performed, substantially as described

2 Apparatus for simultaneously recording photographically the movements and sounds produced by existing things or objects, optically reproducing the movements and simultaneously photo-electrically transmitting and reproducing the sounds, substantially as described.

3. In an apparatus of the kind claimed in Claim 2, the employment of selenium or other equivalent substance whose electric conductivity is varied by the intensity of light, substantially as and for the purpose described

4 In apparatus of the kind claimed in Claim 2, means for varying a source of light substantially as and for the purpose described.

5 In combination in apparatus of the kind hereinbefore referred to, a collector and transmitter for the sounds produced by existing things or objects, means for electrically varying or controlling a source of light, a recording medium, means for translating the recording medium so that it receives photographic impressions of the movements and sounds to be reproduced means for illuminating and projecting said impression of movements, means for illuminating the photographic impressions of sounds and converting them into corresponding electric waves, and means for transmitting and reproducing said waves, all arranged and adapted to operate substantially as described

6 In combination in apparatus of the kind hereinbefore referred to, a receiver of sounds, a transmitter for the collected sounds, an electro-magnet arranged in circuit with said transmitter and adapted to operate a slotted screen or mirror so as to vary light rays, a translatable film for collaterally receiving and recording simultaneous movements and sounds a projector for photographic movement impressions, a source of light and a condenser for condensing its rays, a cell of selenium for converting light rays into electric waves, and a telephonic reproducer for said electric waves, substantially as described and shewn by the accompanying drawings

7 In apparatus of the kind claimed above, a slotted screen comprising fixed and movable diaphragms having inter-registering openings therein in combination with an electro-magnet adapted to operate the movable diaphragm, substantially as described in reference to Figures 3 and 4 of the accompanying drawings

Dated this 11th day of February, 1907

EDWARDS AND CO.
Chartered Patent Agents,
Chancery Lane Station Chambers, London,
Agents for the Applicants

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[Up to this time Mr. Lauste had spent $100.000 of his own money and thirty years of research to perfect his invention, but he could secure no help to finance his invention in Europe, and, when the world war broke out he came to America. Here he made an effort to interest capital to commercialize his invention, but America's entrance into the war again threw his plans into chaos and his health breaking under the disappointment, he found it impossible to make any progress.

In 1923 he entered into an agreement with a New York promoter to finance his invention, but the best this man could do, according to Mr. Lauste, was to "string him along" until 1926, when the inventor again fell ill. While he was helpless at his home in Bloomfield, New Jersey, his financial agent urged him to consent to the removal of all his machinery and instruments to No. 12 East 12th Street, New York, or a more convenient place to work from.

Six months later Mr. Lauste discovered that the promoter had failed to pay any rent or other expenses, and

in addition had hocked the plant for $1000.00 borrowed from the landlord and, for his long years of work and treasure expended he had nothing whatever to show—a tale too often told of inventors who are not also smart business men.

Mr. Lauste is still living at Bloomfield. He is nearly seventy-two years old and informs THE AMERICAN CINEMATOGRAPHER that he is penniless. The editor has before him many documents in evidence, furnished THE AMERICAN CINEMATOGRAPHER by Mr. Lauste, one of which is here reproduced. Among these documents are the Cine Mundial of New York, March, 1918, The Cine Journal of Paris, France, 1911; Science and Invention, December, 1920; The Evening Mail Radio Review, New York, July 14, 1923; excerpts from The Literary Digest, 1918; The Scientific American, December 22, 1917; The Illustrated London News, January, 1920; The Motion Picture News, July, 1919; The Kinematograph and Lantern, London, May 8, 1919; Motor Boating, July, 1918; The Electric Experimenter, June, 1918; The Kinematograph and Lantern, London, November 19, 1914; The London Daily Chronicle, The Cine-Journal, February, 1911; The London Daily Express, etc., and a complete copy (fourth edition) of his Provisional Specification.

THE AMERICAN CINEMATOGRAPHER holds no brief for Mr. Lauste, but it is interested in the principle of "honor to whom honor is due" and, right now, while the sound pictures are so much in the lime light, would seem to be a good time to consider all legitimate claims, review the facts and leave it to the public to make its own awards of credit.—EDITOR'S NOTE.]

Color Helps the Actor

By JANE McDONOUGH

Visitors to motion picture studios often inquire as to the reason for strict attention to color harmony in the furnishings and decorations of the sets, since everything will appear on the screen in various shades of black and white.

Getting players into the proper mood is one of the most important parts played by color schemes and harmonies, declares Mitchell Leisen, for several years past art director of the Cecil B. DeMille Studio and responsible for the art effects of a number of current Pathe pictures.

"An illustration of this comes to my mind in connection with 'Captain Swagger,' Rod LaRocque's latest Pathe picture," Leisen says. "In a cafe scene it was necessary to engender a mood of gaiety and merriment on the part of a couple of hundred players, to provide a proper setting for a dance presented by Rod LaRocque and Sue Carol.

"To this end we employed vermillion, gold and orange in our decorative scheme. The walls, of a pale green, were decorated in fantastic designs executed in gold and vermillion. The table covers were of gold. On each table was a bizarre lamp with modernistic shades in gold, orange and black. Huge lamps of brilliant hue and original design were suspended from the ceiling, which was itself draped with suspended banners of gay silk.

"The brilliance of this scene in 'Captain Swagger' could be only faintly caught by the camera, but it was reflected with accuracy in the animation of the players and the fast tempo at which the action takes place."

"Captain Swagger" was directed by E. H. Griffith and produced by Hector Turnbull. In addition to Rod La Rocque, star, and Sue Carol, leading lady, its cast includes Ulrich Haupt, Richard Tucker and Victor Potel.

Colored Movies Doom Musty Medical Books

(Copyright N Y Times, 1928)

Paris, July 31.—(Special Dispatch)—Ponderous books on medical theory are doomed to the scrap heap and will be replaced by colored motion pictures, according to Dr. Franklin H. Martin, of Chicago, director-general and president-elect of the American College of Surgeons, who has come to Paris to arrange for the filming of the most important operations for use in the world-wide surgical archives.

"The doctor of the future will have a library of medical film instead of shelves of dusty volumes," said Dr. Martin this afternoon. "In case he wants to perfect himself in the intricacies of mastoid operation, for example, he will take out the proper reel and start up the projector, and see the entire operation performed on his own screen.

"Instead of wading through chapters of heavy reading, he will witness the greatest specialist of the day performing the operation."

The physician explained that an attempt is being made to tie up all the leading surgeons of all countries in a scheme for the production of such colored films, as well as slow motion pictures showing the growth, multiplication and death of cells in the development of the human body from childhood to maturity, and similar phenomena with high documentary value.

"When these films are completed," he continued, "they are to be submitted to a special board of the American College of Surgeons. Certain of these films, all highly technical, have already been released, and two hundred more are under production in the United States."

Dr. Martin hopes to succeed in the creation of an international board to supervise the productions, not only including technical films, but also pictures aimed to induce the public to take care of itself and submit to medical examinations.

Vitacolor Is Born

(*Continued from Page 17*)

they are not carried through the process of colored photography intact, they are not exhibited on the screen."

Here are a few outstanding features of Vitacolor which can not fail to prove interesting in the light of the attention which is being focused upon any process which will attract natural color to moving pictures:

It may be used just as effectively in either case with 16 m.m. or 35 m.m. film; the camera using Vitacolor may be equipped with any standard F. 3.5 or other regularly used lens; it does **not** require a special lens and the amateur or professional may "shoot" his picture on cloudy days or in subdued light as well as in the open sunlight; Vitacolor pictures can be projected upon any screen acceptable to the use of black and white pictures; its scope for professional, home, educational, scientific or library work is unlimited, and it may be used with present film sound processes, a feature beyond the possibility of any known color method.

And there you have a nut-shell account of the motion-picture industry's newest sensation—Vitacolor—which will, if we are to believe the earnest account of tecnoligans and writers, revolutionize the world of moving pictures.

Among the guests present at the demonstration were Dr. Alexander Goetz and Dr. E. H. Kurth, representatives of Dr. Robert Millikan, president of the California Institute of Technology.

A DeVry Activity

The Neighborhood Motion Picture Service, Inc., Has Met with Great Success.

The use of motion pictures for visual education has long been the dream of the educator. Leading educators for many years appreciated the inherent value of motion pictures for teaching purposes, and on many occasions have gone on record requesting that such material be made available for their use.

Due to this insistent demand various attempts have been made by different companies and individuals to revise for use in the schools, already existing industrial, advertising and entertainment films. It is an admitted fact that any motion picture film is educational. Whether or not this education is along the desired lines is another factor.

Most of the early experiments along this line were failures, due largely to the fact that it required a great deal of money to prepare and produce such films, and that is not a one man's proposition. As these films are for use in schools and educational institutions, they must be prepared partly at least by those identified with this field.

So many unsuccessful attempts were made to give the schools so-called educational film which were in reality either industrial or advertising film intended for an entirely different application, that the name "Educational Film" has almost become a misnomer.

Mr. H. A. DeVry, a leader in the manufacture of portable projectors for school use, was among the first to realize the crying need for specially prepared school films, but also due to his broad business experience knew that the production of such films was not an overnight proposition but a very serious problem and required not only a production staff but also the collaboration of a group of prominent and practical educators who are authorities on the subjects treated.

In view of his close contact with the schools and educational institutes for the past fifteen years, Mr. DeVry is in more intimate touch with this field than practically any other man.

Being an idealist by nature and keeping this thought in all of his business relations, the question of visual education became a hobby. To properly serve this field required a complete library of films covering the major courses in the school curriculum, to which visual education was adaptable. These films do not supplant the text books but are correlated with them.

From a pecuniary angle educational films are not as profitable as other business ventures. The same amount of capital in an ordinary business venture would yield greater returns in a much less time. But to Mr. DeVry's way of thinking, the actual profit would not afford him the mental pleasure that would be derived from the semi-philanthropic work of properly educating America's school children.

Neighborhood Motion Picture Service, Inc., was founded by Mr. DeVry five years ago for the purpose of preparing and producing films that were designed specifically for use in the schools. As visual education is a hobby of his, the N.M.P.S. received not only the attention that any business enterprise would normally get, but it also enjoyed the guidance of one who made this work his pleasure.

A staff comprising several prominent educators, school authorities and laboratory men aided him. The first work of this group was to write the outline of the thoughts to be given to the student's minds then came the actual reviewing of the film. Some of the material could be obtained from films that were already produced. Several million feet of film were reviewed and any parts of it that were in keeping with the scenario's requirements were used. But as the basic principle behind any N.M.P.S. School films was to make the film to the educators' requirements, it was necessary to produce a large percentage of the shots comprising the 84 reels which constitute the 9 courses that are now available. A large percentage of this film consists of animation and graphs which in practically every instance had to be specially prepared. While there was a certain material on the market of a somewhat similar type to the required material, it did not bring out the points desired to develop the juvenile mind. In no instance was available film allowed to govern the lesson. The story or facts to be impressed upon the student's mind was written first and then film was obtained if possible, and if it was not found, these shots were specially made.

Another point that Mr. DeVry was able to fully appreciate was that in addition to the film itself, a teacher's lesson plan or guide was necessary in order to get the full benefits from the film with a result that a teacher's guide accompanies each film lesson.

About two years ago a number of Neighborhood Motion Picture Service, Inc., school films were rented to some of the leading educational institutions. In the majority of cases they were curious to try out the film and find its reaction on the juvenile mind. The outcome of this test is clearly shown by the fact that these schools have without exception renewed their film contracts and increased the number of subjects used. That N.M.P.S. films are outstanding and inherently different than any other schools films or so-called educational film is proven by the reception afforded it by such men as Dudley Grant Hays, Director of Visual Instruction, Chicago Public Schools; Mr. W. A. Wirt, Supt. of Schools, Gary, Indiana, and Akron Public Schools, Akron, Ohio, and many other leaders in the visual education field.

N.M.P.S. films are available on both 16mm. and 35mm. safety film. To enable the small cross road school to enjoy the same means and the same advantage of the large city schools, films may be rented for a very nominal rental as well as purchased outright.

Present indications lead us to believe that there will be over a million grammer school students enjoying the advantages of school film courses in the next year.

News Reels and Amateurs

Amateur cameramen are destined to play an important role in the recording of world events for theatre newsreels, according to a symposium of opinion of professional newsreel men reported in MOVIE MAKERS, magazine of the Amateur Cinema League, Inc., the world-wide, non-commercial, organization of personal motion picture makers.

"Inasmuch as interesting events are apt to happen without warning anywhere, and since it is impossible to have staff newsreel cameramen in all these spots at the same time, there is opportunity for the scores of thousands of amateur movie makers residing in every corner of the country to film events for posterity, which would otherwise never be recorded," it is declared. "For example, the first aeroplane flight of Henry Ford, made with Colonel Charles Lindbergh, which was an international headline news story, being unexpected, was not covered by any professional newsreeler, but, fortunately, was filmed by an amateur camera woman who happened to be at the Detroit Flying Feld when the unscheduled flight was made.

"Such experience will, of course, be exceptional for the individual, although occurring frequently in the whole field, but there will be constant opportunity for the free lance amateur to record events of a human interest nature for which the big news reel companies are always on the lookout. Then there are the local newsreels, shown only in their own communities or districts, which will offer frequent opportunity to the amateur.

"In fact, with the awakening of the amateur to the possibilities of co-operation with the famous newsreels, these agencies of filmed information will acquire an international network of agents which will increase their efficiency to a degree at present unknown."

QUICKIES

Funny thing. Quickies is despised by everyone having anything to do witb them. Actors bate 'em. Cameramen loathe 'em. Directors make 'em only when driven to it. Yet they're tbe mainstay of the industry.

Anybody who can get a job with a big outfit that'll sbake down for heavy jack each week through eight or ten weeks' preparation and three or four months' shooting is a sap not to do it. But it ain't making pictures.

Making pictures ia making pictures—and that's just what doing quickies ain't nothing else but. They get an idea one day and ship the film the next.

The one big difference between the stuff turned out by the nickel-nursers and the big outfits is tbat in tbe quickies it don't take so long to read the credit titles. Their stuff ia alike because they can't afford to be different.

Let's make that clear. The big outfita sock so mucb dough into a production that they've got to keep it full of sure fire tried and true audience stuff to be sure to get the dough back; and the little companies have got so little dough to put into a production that they've got to keep it full of sure fire tried and true audience stuff to be sure to get the dough back. Aside from this, they are pretty much alike.

Another great difference is that neither one can afford to be original. The big companies can't afford to risk hundreds of thousands on an untried idea; and the little companies can't afford to risk a nickel on anything

Big outfits take a pip of a story that sets 'em back a lot of jack and strain it through a dozen or so great hrains in order to add all possible value from the immense resources of the studio. Said great brains, working on a dollar-a-second salary have got to show a reason for that aalary being paid—and thsy sure do. The ideaa they stick into that story havs got to click and they know it. So they stick in only ideas positively sure to click. The clickier the better. By the time the story gets through the brain department the story has more clicks per reel thana fishing rod. And they're all good aure clicks because they're taken from hither and yon, not to mention hence and thither, or wherever else audiences are responding to clicka that clicketh themselves a-right.

Quickie companies cannot afford to do this. The best they can do is to pick up some little home-made story for next to nothing and boost it up with gags like they use in the big pictures.

The little joints can't afford to hand out big salaries for actors. Couple thousand a week is about their limit. Even that ia an awful stretch for them, hecause it means handing out four or five hundred dollars just to one person for just one part—on a split week pro rata salary. Pretty tough. So they have to make their picture with youngsters struggling for recognition or old-timers struggling for re-recognition. The larger companies have got it on them in this. They can afford to bring new, untrained material from abroad and groom 'em, while the production values are beld up with well-known names.

Big companies spend thousands bringing fresb faces to the screen. The little outfits can't afford to use no other kind.

I could go on pointing out these differencea indefinitely but it ain't no use. Comparison of the products tells everything. What I started out to say was that quickies are the mainstay of the business—and they are.

It'a tbis way: Every company tbat amounts to anything started out as a cheap outfit—the cheaper ths better. All the onss that started out with a whoop and hurray to knock 'em dead had to limp into a corner to dia.

There's a regular cycle to it. Quick pictures make rich companies. Rich companies make big pictures. Big pictures sink rich companies. Repeat indefinitely and you bave a tabloid history of tha movies.

As long as there's a top there'a got to he a bottom. Quickies are at the hottom—some think even lower than that—of the gama. But the bottom is also the foundation; and quickie productions and quickie production methods are at the foundation of every big company.

Of the companias that have fought for first place for the last few years there ain't a one tbat at some time wasn't a place where folks kind of kept it dark about working there. But they worked up and up until now they are outspending each other for first place. So long as they keep one foot on the ground they go great, but the minute they get better than their bringing up there's a lot of good crashing done. It coats money to be good; and when they get so good that nothing's good enough for them to make they stop making. It may be great art to refuss to make any pictures at all unlesa they're bigger and better; hut it's bad business. Because, although a company can stop making pictures if it wanta to, it can't stop costs from costing. It'a the old guillotine atory over again—it'a the overhead that kills you.

There's where the quickie outfits bave the edge. A big layout that runs out of wows and haa to wait until a new genius is born and grows up to write their next story has a lot of contracta and what nots to pay; but if any such mirakle sbould occur that a quicky company gets held up for a atory and shuts down all they have to pay is a watchman and a nickel's worth of liver for the cat.

But they don't shut down. Not shutting down is where they shine. They don't ever have to stop, hecause they've got a whals of a market to supply—a market that's just got to have a lot of cheap pictures. That market has got to have pictures and it would like to have good picturea, but good or bad, the pictures must be cheap. There's just ao much money in the neighhorhood these theatres supply and no more. That settles the money question. Now then, tbe theatre owner in sucb a place simply cannot see the aense of paying for big, expensive pictures when he can get 'em just as had elsewhere for lesa money.

A million dollars can be spent so as to make one picture or twenty. Under regular every-day conditions the twenty picturea will take away and by far the most money and can't lose; while the million-dollar baby is a long stevie at best and may haul a few million down with it when it ainks.

Quickies can't lose money. Big pictures can.

But the greatest thing about the quickies is that they produce pictures—plenty of them. Last year they beat Amalgamated Alley Cats in number of unita produced, although the cats claim a greater uniformity of product. Tbis grinding out of hundreda and hundreds of pictures is what keeps the game alive—no kidding. It'a the lot of little money spread all around that keeps Hollywood in the game—not the hunks dumped down in a few for-

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Kodacolor Demonstrated

New Film Color Process Developed by Eastman for Use in Amateur Motion Picture Photography

[*On July 30 many scientists and other distinguished men gathered at Rochester, New York, as the guests of George Eastman, to witness a demonstration of Kodacolor, the new film color process developed by the Eastman Kodak Company. For the material composing the accompanying article THE AMERICAN CINEMATOGRAPHER is indebted to Mr. Herford Tynes Cowling of the Eastman Kodak Company and to Mr. Russell B. Porter, staff correspondent of The New York Times.*—EDITOR'S NOTE.]

What "Kodacolor" Is and Does

The new film color process which the Eastman Kodak Company has developed and adapted to the use of amateur motion picture photographers, gives them a cheap and easily operated means of obtaining, as James G. Harbord puts it, a "complete record of life." The pictures when projected are in natural colors, though the film itself is black and white.

The effect is obtained by a multitude of tiny lenses which are part of the film itself, and exclude certain rays of color light from certain areas of the film, and admit others.

Use is made of the three colors, red, green and blue, in such a manner that all the other colors and gradations of color in nature are captured and may be reproduced.

All that the amateur photographer of motion pictures has to do is to attach a color filter device to his motion picture camera—an operation simply performed—and then take his pictures as he would with a camera adapted only to black and white photography.

The films are developed for him speedily at any of the many Eastman service stations in all parts of the world. In the process of development, his negative is converted into a positive, and the same film which he used is returned to him for projection.

In this projection of the pictures, it is necessary only to attach another simply adjusted color filter to the projection machine. This restores on the screen the colors which are not visible in the film itself.

In taking the pictures or in their projection, all that the photographer has to do is to attach his color filters, thread in his film as he would in ordinary motion picture photography or projection, and start his mechanism. The new device "does the rest."

The machine age again triumphs in its imitation of nature and the movies produce another astonishing novelty from their apparently inexhaustible bag of magical effects.

On July 30, 1928, George Eastman, 74 years old, inventor and manufacturer of cameras and moving picture film, realized his dream of a quarter century when he announced the perfection of a system of color photography whereby any amateur photographer can take moving pictures which reproduce all the colors of the spectrum in all their beauty.

Before a distinguished audience of scientists, inventors, educators, publishers and business leaders, in his private projection room in his home in Rochester, Mr. Eastman gave the first public demonstration of his new "kodacolor" process, casting incredibly gorgeous color tones on a moving picture screen less than half the size of an ordinary classroom black board.

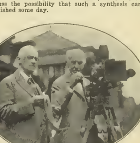
Coming so soon after the advent of television and recent improvements in the "talking movies," the "kodacolor" process was regarded by those who came here for the demonstration as heralding an era in photography which may make the present, with all its scientific advances, look like a backward age.

The perfection of color photography and the perfection of vocal films have been the most difficult technical problem confronting scientists and engineers working in the moving picture field. Now that success seems near at hand, the practical idealists assembled here look forward to a feat that would have appeared fantastic a generation ago—color television synchronized with radio.

So many apparently impossible things happened at Eastman's, on July 30, that one must be a reactionary to the last degree to deny the possibility of a combination of action, sound and color, all reproduced in synchronization for entertainment in the home. In other words, a picture of Babe Ruth or his successor, knocking out a home run, seen and heard at home through color television, pandemonium coming in by the ears and by the eyes a kaleidoscope of green sward, drab infield and many colored grandstand.

Or a Yale-Harvard football game, with its contrasting reds and blues, both primary colors, and its college songs by radio.

One did not see and hear this combination of action, color and sound at Mr. Eastman's home, but men like Major Gen. James G. Harbord, President of the Radio Corporation of America, and Dr. E. F. W. Alexanderson, one of the inventors of television, were not afraid to discuss the possibility that such a synthesis can be accomplished some day.



Thomas A. Edison at the Mitchell Camera. George Eastman standing by.

What was actually seen was color and action thrown upon the same screen in a manner suitable to the home movie. Because of technical difficulties, the screen had to be small, 16.5 by 22 inches, as compared to that, 22 by 30 inches, used for the ordinary black and white movies already made by the Eastman Company for amateurs, and as compared with the screen, measured in feet rather than inches, used in moving picture theatres.

Nevertheless, it was fully large enough for entertainment in the home circle. Whether the process can be worked out for theatres is a question of whether enough additional lighting power can be put behind the film, a problem which the Eastman experimenters have not yet touched.

Technical Memorandum

The way the process announced today makes colored motion pictures is not so occult as such a remarkable development might seem, yet it works by such microscopic neo-magic as only the methods of modern science can deal with. A phenomenon of the process is that the film itself contains no color at any time.

The amateur cinematographer's part has been made easy. He merely has to insert a "color filter" into his

camera and thread his Kodacolor Film. But actually, when he makes color movies, without knowing it he uses hundreds of lenses and he disentangles thousands of tenuous threads of light.

The many new lenses introduced into the process are cylindrical lenses embossed right on the film, composed of the film base material and extending lengthwise of the film. The lenses on the film are about seven times narrower than the tiny dots making up the illustrations in a newspaper, and as such they are invisible except under a microscope. They cover completely the surface of the side of the film opposite from the sensitive emulsion. That surface faces the camera lens, and the emulsion is away from the lens, contrary to the threading arrangement for ordinary film.

When the trigger of the camera is pressed, light reflected from the subject passes selectively through the three-color filter, on through the camera lens, and thence through the tiny embossed lenses on the film to the sensitive emulsion coating on the opposite side, where it records itself on the silver compounds therein contained.

White light, as is well known, is composed of all the colors of the spectrum. This can be seen when white light shines through a prism or when it appears as a rainbow reflected prismatically from the drips of falling rain.

The color filter is striped in the three primary colors of the spectrum—red, green and blue. The reverse of the fact that white light divides up into the colors of the spectrum is that light coming evenly out from the three colors of the filter on a projector and superimposed on a screen appears white.

But cover up the green and blue segments of the filter and the screen will turn red. Cover up the red and blue and the result gill be green. Similarly, white light minus red and green gives blue.

White light minus blue only, with the red and green areas both left for the light to shine through, gives yellow. White minus red gives blue-green. White minus green gives purple. Varying the areas of each color through which the light may shine gives the infinite shadings between these colors. Black is the total elimination of light.

Out of the rays of light which spread like a fan over the filter from every point of color in front of the camera, the red area lets only the red fraction go through the lens, the green lets only the green through, and similarly the blue excludes all but the blue. Kodacolor Film is panchromatic, that is, it is equally sensitive to all colors. Through the camera lens these separated rays pass, each to be focussed on the part of the film frame corresponding to the part of the subject from which it came.

Then the embossed lenses do their work. If there were no embossed lenses, the rays representing the three colors would converge on the sensitive emulsion as a single point and the film would become ordinary black and white, with no differentiation of colors on the film. But the embossed lenses guide the one or two or three rays falling upon each tiny area of the film and lay them on the sensitive emulsion in an orderly fashion as three distinct impressions at any one spot.

Just as the camera lens spreads an image of the scene in front of the camera over the whole film surface, so each of the minute embossed lenses portrays, on the very small area of sensitive substance that it covers, the scene immediately in front of it—which is the camera lens as seen from that particular point on the film. Of course this means that the sensitive emulsion behind each tiny embossed lens will receive, not an image of the whole scene in front of the camera, but only a small bit of the scene, since any point on the film receives rays from only a corresponding space on the scene in front of the camera.

The three filter colors covering the lens are imaged behind each tiny cylindrical lens as three parallel vertical stripes, because the tiny cylindrical lenses are parallel to the stripes of color on the filter. Thus the width of each of the minute areas of emulsion is subdivided into three parts related to the three filter colors and affected by light that is able to pass through the colors. The sum of these invisibly small affected areas of film constitutes

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Mole-Richardson Expand

Construction work has been started on the new plant of Mole-Richardson, Inc., manufacturers of studio lighting and electrical equipment, the architect's drawing of which is here presented.

The new factory, offices and sales rooms, will be located in the Hollywood manufacturing district, at 941 North Sycamore St., one block and a half south of Santa Monica Blvd.

The building as planned will be a single story, of brick and concrete construction, the general offices, engineering department and display rooms at the front, with machine shop, assembling, testing and experimental departments utilizing the remainder of the building, which includes a section of mezzanine floor.

The plans came from the offices of Marshall P. Wilkinson, of Hollywood, who is also superintending the erection of the new plant, which will be ready for occupancy about October first.

Although the incorporators of the company have for many years been engaged in the design and manufacture of lighting equipment, Mole-Richardson, Inc., is still young in years, with the enthusiasm and energy of youth prominent in its work.

The officers of the company are Peter Mole, President; Elmer C. Richardson, Secretary-Treasurer; and Irving E. Steers, Vice-President.

During the past year and a half this company has developed many excellent incandescent lighting units for use in studio motion picture photography. It has had to do the pioneering that goes with any departure from the usual method and it will give the A. S. C. great pleasure to see the organization in its new home. We congratulate M-R and wish them the success they have so well deserved.

Robert Kurrle, A. S. C., is almost recovered from an operation for appendicitis which kept him in the California Lutheran Hospital for two weeks. Mr. Kurrle is a veteran of the A. S. C. and has long been associated with Director Edwin Carewe.

Jimmy says—Argue about art all you want to; but when you shoot, get it clear.

Alvin Wyckoff, member of the Board of Governors of the A. S. C., has returned from a long sojourn on location in Canada.

Jimmy says—In photographic currency, inserts are the pennies, long shots are the dimes, medium shots are the halves, closeups are the dollars. Silence, as usual, is the gold.

Rene Guissart, A. S. C., who has been at Elstree, England, for several months, photographing the new English star, Betty Balfour, has been sent to Germany, where his star will be featured in "Paradise," a special to be directed by Denison Clift.

Akeley Universal "Gyro" Tripod

(Continued from Page 14)

both the pan and tilt may be securely locked, independently of each other at any position.

(4.) In certain instances where the degree of movement of the panoram or tilt can be predetermined, the photographer may adjust stops on pan or tilt head and thereby eliminate any possibility of over panning and tilting.

(5.) Means are provided in the tilt head which automatically prevents the camera from tilting downward or upward due to its own unbalanced weight.

(6.) The Gyro unit is completely ball-bearinged and contains the special Akeley back lash eliminating devices which insures the smooth steady motion when following moving objects.

(7.) Besides furnishing the usual type of Akeley Tripod Legs that have enjoyed such an unusual degree of success with the Akeley Camera, we have produced a new studio leg which includes the Akeley quick locking device that clamps or releases the legs a quarter turn of a single handle or grip. A stop is provided which prevents handle from being turned more than one revolution in the wrong direction.

The sticks of the new studio legs are made of selected maple which are allowed to season for a period of twelve months before the final forming cut is made. This insures the elimination of internal stresses which prevents warpage of the legs to as large a degree as possible in anything made of wood.

(8.) The tilting head contains bronze bearings which are tapered to a perfect fit on the adjustable pivot shafts. In the event of wear after long use this makes it easy for anyone to make simple compensating adjustments.

(9.) Each gear is composed of two sections, together with the Akeley compensating device which automatically maintains the gear teeth in proper relation to each other and insures a steady transmission of power to the flywheel.

(10.) The large diameter of the Gyro gearing and extra wide gear faces, together with the fact that they are all made of special composition which has the strength and durability of steel, insures a long life to the moving parts.

Jimmy the Assistant

(Continued from Page 29)

tunate laps. And it's the lot of little pictures endlessly produced that keeps the theatres out of the red—if ever.

More great pictures have been perduced by quicky methods than any other way. But that's nothing against them. Accidents will happen.

More great directors have been perduced by quicky companies than from any other source. They had to be good to qualify as director in these sprinting contests, and the experience of knocking 'em out in nothing flat gave 'em a year's experience a month.

Actors the same way. Tomorrow's stars come from Poverty Row. They're cutting their teeth on the tough meat of hard work and slim pay, but if they're sharp enough to do that they'll land anywhere.

All boiled down it amounts to this—the cheap outfits make pictures—the others don't. They keep the theatres alive. They keep the actors alive—between good jobs. And they are the nursery of the business.

If you don't agree with me—all right. It's just one guy's opinion and we all must have opinions whether they're competent or not. Just how much an assistant's opinion is worth I don't know, but here's mine for whatever it's worth.

Yours for more quickies,

JIMMY.

Kodacolor Demonstrated

(Continued from Page 31)

the whole photographic image.

A red ray from an object in front of the camera, for instance, touches the sensitive material of the film at a spot related to the red area of the filter. Developing by the "Reversal Process" in use for amateur movie films turns this affected spot into a transparent area, leaving opaque the adjoining unaffected areas related to the green and blue segments of the filter. Therefore, in this case, the projector light can shine only through the invisible small points on the film which will send beams to the red projector filter and out to the screen as pencils of red light.

So also with the green and blue and with combinations of colors. The sum of the points on the scene containing red makes a photograph from red light on the emulsion areas related to the red filter segment, the sum of the blue also makes a separate photograph, and similarly with the green.

Then the projection. Recollect back (p. 2, paragraphs 3 and 4), to the explanation of how various colors are thrown onto the screen by the covering up different combinations of filter colors on the projector. Well, that is just how Kodacolor is projected. The opaque areas of the film cover up, in effect, certain of the filter colors: they prevent the light from going through where it is not needed, by cutting off, at the film, rays which would otherwise pass out through the embossed lenses, through the camera lens, and through the filter color in question to the screen.

For any point on the scene, only the colors are permitted to be projected which blend on the screen into the corresponding colors of the scene photographed. The pattern of these rays from all the cylindrical lenses on each frame projects a picture on the screen, with each ray contributing its speck of light to the color or blend of colors at one point.

The film itself is not colored. The colors of the subject are delineated merely by transparency on the film or by black metallic silver deposited in various degrees of opaqueness, so as to permit light to shine through one of the three sections of the filter as directed by the tiny film lenses.

Despite all this difficult description, the most important fact about the new process is that henceforth amateur photographers can make movies in full natural color without giving a thought to the minute magic of the process.

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FOR SALE—8x10 Corona Camera, Wollensack 8x10 12-inch F.4.5 lens, 6 plate holders and tripod, $90 00. Also 2¼x3¼ Grafies, Bausch & Lamb F.4.5 lens, $40.00. $126 00 if sold together. To be inspected at A. S. C. office GRanite 4274

FOR SALE—Bell & Howell, excellent mechanical condition, six magazines; three cases. Brand new Astro F 2.3-60 mm Goerz 76 and 40 mm B. & H. tripod with Mitchell legs. Large single arm iris with B & H shade box, 4-way matt box, Gauze matt holder and two inch glass filter holder. $1,976 cash. Vernon Walker, 601 W Fairmount St., Glendale, Cal , or A S C offices.

FOR SALE—MISCELLANEOUS

FOR SALE—Four slightly used Mitchell Matt boxes at $40 00 per set. Call Chas. Glouner at Universal Studios. HEmpstead 9131.

FOR SALE, CAMERAS—B. & H. Camera No. 676 with 50 mm. B. & L. F.2.7 40 mm. Goerz Hypar F.3 6 and 75 mm. Zeiss Tessar F.3.6. Mitchell Tripod, 6 magazines, Universal big finder, brand new Matt box and countless other things for sale. Call John Stumar or Chas. Glouner at Universal Studios. HEmpstead 9131

FOR RENT—CAMERAS

FOR RENT—DeVry Standard Automatic, new. Bernard Smith Phone between 8:00 a m. and 4.30 p m., GRanite 1194 or 6 to 6, DUnkirk 7668

FOR RENT—Two Bell & Howell cameras, Mitchell tripods, large finders, all F/2.8 lenses. Also Cinemotor and friction head for Akeley work. Frank Cotner, 6273 Selma Ave., HOlly 6046.

FOR RENT—170 deg. Bell & Howell, 3" F 1 9 Dallmeyer, 9" F 9 6 Goerz, 2" F 2.3 Astro; 40 mm. F 9 6 Goerz, Mitchell tripod with Bell & Howell head, baby tripod, six magazines and prism. Call TErrace 9162.

FOR RENT—Mitchell Camera No. 97 with latest high speed movement, high speed gear box and cable, complete, for high speed work, with or without operator. Equipped with Astro 40 m.m. F.1.8 Astro 60 m.m. F.2 3 Astro 76 m.m. F.1.8. Eight magazines and Stumar matte box with filter holders and sun shade. Mitchell Camera No. 88 with regular movement. Astro 40 m.m. F 2.9 Astro 76 m.m. F 2.9 Ruo 60 m.m. F 1.26. Eight magazines and Stumar matte box with filter holders and sun shade. Eyemo Camera with Hoefner tilt and pan. Pliny W. Horne, 1919 N. Stanley Ave,, Holly 7692 or Mitchell Camera Co., Holly 3946

FOR RENT—Three Bell & Howell 170 Degree Cameras, F. 2.8 and Linden, 6017 Elinor Ave , Hollywood. HEmpstead 8333 or F. 2 6 lenses, Mitchell Tripod legs. Complete equipment. Eddie A. S C. office, GR 4274, GR 4704.

FOR RENT—Camera equipment: 1 Mitchell Camera, 1 Mitchell Speed Camera with attachment, new. 1 Bell & Howell, 1 Akeley (Full Equipment). Ted Tettslaff, Phone CR 9255. 1724 N. Western Ave , Hollywood

FOR RENT—Complete Mitchell outfit, with Astro Lenses—Phone Mitchell Camera Co., HO-3499 for equipment of John Silver, A. S. C

FOR RENT—Four Bell & Howell Cameras, one cinemotor and friction head for Bell & Howell, 2.3 Astro lens, large Prismatic Mitchell finders and Mitchell legs. Special built-in side Prisms. Baby tripod, extra tripod; six inch lens in mount. Richter Photo Service, 7764 Santa Monica Blvd , GL-7804, at night HE-1780, or B. B Ray, 691-331

FOR RENT—Complete Mitchell outfit with astro lenses, six magazines, by Al Gilks, HE 1496.

FOR RENT—To reliable party, one Bell & Howell camera with Mitchell legs, Astro Lens F. 2 9., Fl. 9. 6 magazines. Fred Hoefner mat box. In perfect shape and fully equipped. Jos LaShelle. ORegon 6730.

FOR RENT—CAMERAS, ALL KINDS. Akeley, Bell & Howell 170%, also Speed DeVry Graflex, Still (late model Anscos). For rent by day or week to responsible parties. Ries Bros , Ries Bldg , 1152 No Western Ave. Phone GRanite 1186; Residence, HO-1065.

MITCHELL and Bell & Howell cameras. F.1.9 and F.2.3 lens equipment. All kinds of lenses and equipment for rent. John S. Stumar, 9802 Cardiff Ave., Palms. Los Angeles. Phone: Culver City 9612 or call C. Glouner, Camera Dept., Universal City, HEmpstead 9131.

ONE DE VRY Motion Picture Camera. Complete outfit. Alvin Wyckoff, Phone Care A. S. C., GRanite 4274.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles. California. 696-944.

BELL & HOWELL—Phone Perry Evans, OL 9797 or Hollywood A. S. C.

BELL & HOWELL, 170, with 86, 40, 60 and 76 lens equipment. Baby tripod. Also B. & H. Cine motor. Charles Stumar. GRanite 9946. 7601 Lexington Ave., Hollywood.

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FOR RENT—One Cinemotor with Veeder counter in first class condition. Baby tripod, extra tripod. Mitchell friction heads for Bell & Howell camera. Six inch lens in mount. Richter Photo Service, 7764 Santa Monica Blvd , GL-7804, at night, HE-1780.

FOR RENT, LENSES—Trick lenses of all descriptions for rent by day or week. Call George Meehan, A. S. C. Phone GR 9986, 744 North Curson Ave., Hollywood, California.

FOR RENT—STILL CAMERAS

FOR RENT 1 8x10 Still Camera, focal plane shutter, complete, 1 Mitchell Friction Tripod, new, for B & H. 1 Eyemo Camera with special lock. 1 4x6 Graflex B. & L. lens. 1 B.-H Low Boy to fit new style B.-H. Tripod head. Jos LaShelle, 639 N. Sierra Bonita, ORegon 0730.

FOR SALE—LENSES

FOR SALE—4 inch F 2.7 Carl Zeiss Lens. Brand New. Make an offer. Ray L. Ramsey GLadstone 2466.

FOR SALE, LENSES—Carl Zeiss, F. 3.5, 50 mm., mounted in latest B. & H. mount. Perry Evans, 413 No. Mariposa Ave. Hollywood, California.

FOR SALE—60 m.m. Goerz Hyper lens F. 3 6 in B & H mount, $25, 60 m.m. B. & L. lens F. 2.7 in B. & H. mount, $46. J. N. Giridlian, Phone TErrace 9162.

ONE two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F 2:9. Georges Benoit, care of American Society of Cinematographers, Hollywood, California.

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